COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

MARK PESTRELLA, Director

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
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P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: BRC-2

March 10, 2026

INVITATION FOR BIDS
PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT – BRC0000616

Notice is hereby given that the Director of Public Works will accept sealed bids for furnishing all materials, labor, and equipment required to complete construction for the Pathway Torrance Community Health and Wellness Center Renovation Project.

The bids must be submitted electronically using Bid Express, www.BidExpress.com, before 11:00 A.M. on Tuesday, April 14, 2026, and no bids may be submitted after that date and time. Bids will be opened and publicly declared at 2:00 P.M. on Tuesday, April 14, 2026, via online webcast.

If you have any questions regarding this Invitation for Bids, you may contact Ms. Jennell Hluz at (626) 300-2362 or by e-mail at jhluz@pw.lacounty.gov.

Very truly yours,

MARK PESTRELLA, PE
Director of Public Works

Soo Kim

SOO KIM
Division Chief
Business Relations and Contracts Division

SK:jh

PROJECT MANUAL

PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT

2300 WEST CARSON STREET
TORRANCE, CA 90501

SPECS. NO.7669; C.P. NO. 8A022

La Canada Design Group (LCDG)
630 North Rosemead Boulevard, Suite 400
Pasadena, CA 91107

March 2026

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUSINESS RELATIONS AND CONTRACTS DIVISION
900 SOUTH FREMONT AVENUE
ALHAMBRA, CA 91803-5311
(626) 300-2362
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PROJECT MANUAL - TABLE OF CONTENTS
BIDDING AND CONTRACT REQUIREMENTS

DIVISON 00	BID REQUIREMENTS	PAGE(S)
Section 00 01 00	Instructions to Bidders	1-36
Section 00 03 00	Form of Bid	1-3
Section 00 03 10	Best Management Practices	1-1
Section 00 03 11	Construction and Demolition Debris Recycling Requirements	1-1
Section 00 03 12	Insurance Requirements	1-1
Section 00 03 14	Certification to Comply with Countywide Community Workforce Agreement (CWA) Form	1-1
Section 00 03 15	Cost Impact of Countywide Community Workforce Agreement (CWA) Form	1-1
Section 00 04 00	Attestation of Contractor's Qualifications	1-2
Section 00 04 10	Bid Bond	1-1
Section 00 04 30	List of Subcontractors	1-4
Section 00 04 35	Community Business Enterprise Participation Form	1-2
Section 00 04 38	Request for County Program Preference Consideration	1-2
Section 00 04 38A	Subconsultant Certification Form	1-1
Section 00 04 40	Equals	1-2
Section 00 04 50	Noncollusion Affidavit	1-1
Section 00 04 60	Attestation of Willingness to Consider GAIN/GROW Participants	1-1
Section 00 04 65	3-Year Contracting History	1-1
Section 00 04 70	False Claims	1-2
Section 00 04 71	Civil Litigation History	1-2
Section 00 04 72	Criminal Convictions	1-2
Section 00 04 73	Debarment	1-2
Section 00 04 74	Labor Law/Prevailing Wage	1-2
Section 00 04 75	Integrated Pest Management Program Compliance Certification	1-1
Section 00 04 76	Charitable Contributions Certification	1-1
Section 00 04 77	Prospective Contractor List of Terminated Contracts	1-1
Section 00 04 79	Contribution and Agent Declaration Form	1-5
Section 00 04 85	Contractor Employee Jury Service Program	1-1
Section 00 04 87	Certification of Compliance-Contact with County Personnel and Code of Silence Period	1-1
Section 00 04 90	Contractor's Industrial Safety Record	1-1

Section 00 04 91	Injury and Illness Prevention Plan and Code of Safe Practices Affidavit	1-1
Section 00 04 92	Bidder's Organization Questionnaire/Affidavit	1-2
Section 00 04 93	Certification of Compliance with the County's Defaulted Property Tax Reduction Program	1-1
Section 00 04 94	Avoidance of Conflict of Interest	1-1
Section 00 04 95	Familiarity with the County Lobbyist Ordinance Certification	1-1
Section 00 04 96	Proposer's EEO Certification	1-1
Section 00 04 97	Compliance with Fair Chance Employment Hiring Practices Certification	1-1
Section 00 04 98	Zero Tolerance Human Trafficking Policy Certification	1-1
Section 00 04 99	Disallowed Cost Attestation	1-1

CONTRACT FORMS

Section 00 05 00	Sample Agreement	1-30
Section 00 06 10	Bond of Faithful Performance	1-1
Section 00 06 20	Payment Bond for Labor and Materials	1-1

CONDITIONS OF THE CONTRACT

Section 00 07 00	General Conditions	1-53
Section 00 08 00	Supplemental Conditions	1-20
Section 00 09 12	Local and Targeted Worker Hire Program	1-9

DIVISION 1 GENERAL REQUIREMENTS

Section 01 00 00	Project General Requirements	1-7
Section 01 14 00	Alteration Project Procedures	1-4
Section 01 23 00	Alternatives	1-1
Section 01 26 13	Contractor's Request for Information	1-3
Section 01 29 73	Schedule of Values	1-2
Section 01 29 76	Progress Payment Procedures	1-6
Section 01 31 00	Coordination and Meetings	1-5
Section 01 31 19	Progress Meetings	1-2
Section 01 32 00	Construction Schedules	1-13
Section 01 32 33	Photographic Documentation	1-2
Section 01 33 00	Submittals	1-11
Section 01 33 23	Shop Drawings, Product Data and Samples	1-6
Section 01 45 00	Quality Control	1-6

Section 01 50 00	Temporary Facilities	1-5
Section 01 57 00	Storm Water Pollution Prevention	1-15
Section 01 57 19	Temporary and Environmental Controls	1-10
Section 01 60 00	Product Handling	1-2
Section 01 66 00	Transport, Handling and Storage	1-2
Section 01 74 19	Construction and Demolition Debris Recycling	1-2
Section 01 74 23	Final Cleaning	1-3
Section 01 75 00	Project Added Stock	1-2
Section 01 77 00	Contract Closeout	1-7
Section 01 78 23	Operations and Maintenance	1-5
Section 01 78 36	Guarantees and Warranties	1-3
Section 01 78 39	Project Record Documents	1-3

DIVISION 02 EXISTING CONDITIONS

Section 02 41 13 Site Demolition
Section 02 41 20 Selective Building Demolition

DIVISION 03 CONCRETE

Section 03 30 00 Cast In Place Concrete
Section 03 54 16 Hydraulic Cement Underlayment

DIVISION 04 MASONRY

Section 04 21 13 Brick Veneer
Section 04 21 13 Masonry General Guidelines for Cutting and Patching
Section 04 21 29.01 Removing Graffiti from Historic Masonry and Tile
Section 04 21 29.02 Sealing Terra Cotta

DIVISION 05 METALS

Section 05 12 00 Structural Steel
Section 05 40 00 Cold-Formed Metal Framing
Section 05 50 10 Interior Metal Fabrications
Section 05 52 13 Pipe and Tube Railings
Section 05 73 00 Decorative Metal Railings

DIVISION 06 WOOD, PLASTICS AND COMPOSITES

Section 06 10 00 Rough Carpentry

Section 06 10 53 Miscellaneous Rough Carpentry
Section 06 16 43 GMF Gypsum Sheathing
Section 06 40 16 Interior Architectural Woodwork
Section 06 41 19 Plastic Laminate-Clad Wood Casework
Section 06 46 00 Interior Wood Trim

DIVISION 07 THERMAL AND MOISTURE PROTECTION

Section 07 11 13 Bituminous Damproofing
Section 07 21 50 Building Enclosure Insulation
Section 07 25 13 Sheet Weather-Resistive Barriers
Section 07 42 13 Formed Metal Panels
Section 07 54 19 PVC Roofing
Section 07 62 00 Sheet Metal Flashing and Trim
Section 07 65 26 SASM Flashing
Section 07 72 00 Roof Accessories
Section 07 84 00 Firestopping
Section 07 92 00 Joint Sealants

DIVISION 08 OPENINGS

Section 08 12 13 Standard Hollow Metal Frames
Section 08 13 13 Standard Hollow Metal Doors
Section 08 14 16 Flush Wood Doors
Section 08 31 16 Access Panels
Section 08 52 13 Wood Windows
Section 08 52 14 Metal -Clad Wood Windows
Section 08 71 00 Door Hardware
Section 08 81 00 Glass Glazing
Section 08 83 13 Mirrored Glass

DIVISION 09 FINISHES

Section 09 05 16 Preparation of Concrete Substrates for Finish Flooring
Section 09 21 16 Gypsum Board Shaft Wall Assemblies
Section 09 22 16 Lightgage Metal Framing
Section 09 22 26 Metal Suspension Systems
Section 09 24 23 Portland Cement Plastering
Section 09 28 15 GMF Gypsum Tile Backing Board
Section 09 29 00 Gypsum Board
Section 09 30 00 Tiling

Section 09 30 20 Routine Cleaning and Stain Removal of Ceramic Tile
Section 09 51 13 Acoustical Panel Ceilings
Section 09 62 62 Metal Flooring Transitions
Section 09 65 14 Resilient Base
Section 09 65 19 Resilient Tile Flooring
Section 09 68 13 Tile Carpeting
Section 09 68 17 Commercial Sheet Carpeting
Section 09 81 33 Acoustical Insulation, Sealants, And Accessories
Section 09 84 15 Acoustical Ceiling Baffles
Section 09 91 00 Painting
Paint Products Schedule
Section 09 97 13 High-Performance Steel Coatings
Section 09 97 23 Penetrating Concrete Floor Sealer

DIVISION 10 SPECIALTIES

Section 10 14 13 Regulatory Signage
Section 10 21 13 Toilet Compartments
Section 10 26 00 Wall Protection
Section 10 28 13 Commercial Toilet Accessories
Section 10 44 00 Fire Protection Specialties

DIVISION 11 EQUIPMENT

Section 11 31 10 Conference Room Appliances
Section 11 31 13 Kitchen Appliances

DIVISION 12 FURNISHINGS

Section 12 22 13 Draperies
Section 12 24 13 Roller Windows Shades
Section 12 36 63 Solid Surface Material Countertops
Section 12 36 64 Quartz Agglomerate Countertops

DIVISION 13 SPECIAL CONSTRUCTION

Section 13 34 19 Metal Building Systems

DIVISION 14 CONVEYING EQUIPMENT

Section 14 24 00 Hydraulic Elevators

DIVISION 15-20 NOT INCLUDED

DIVISION 21 FIRE SUPPRESSION

Section 21 13 13 Fire Suppression Sprinkler System

DIVISION 22 PLUMBING

Section 22 05 00 Common Work Results for Plumbing
Section 22 05 13 Basic Plumbing Materials and Methods
Section 22 05 53 Plumbing Identification
Section 22 07 00 Plumbing Insulation
Section 22 10 00 Plumbing

DIVISION 23 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

Section 23 00 00 Mechanical Heating Ventilation and Air Conditioning
Section 23 05 00 Mechanical Common Work
Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment
Section 23 05 48 Mechanical Sound Vibration and Seismic Control
Section 23 05 53 Mechanical Identification
Section 23 05 93 Testing, Adjusting and Balancing for HVAC
Section 23 07 00 Mechanical Insulation
Section 23 08 00 Mechanical Systems Commissioning
Section 23 09 00 HVAC Instrumentation Controls
Section 23 30 00 Mechanical Air Distribution
Section 23 31 13 Mechanical Metal Ducts
Section 23 33 00 Air Duct Accessories
Section 23 80 00 Heating Ventilating and Air Conditioning Equipment
Section 23 80 01 Heat Pump Variable Refrigerant Flow Equipment
Section 23 81 26 Split System Air Conditioners

DIVISION 25 INTEGRATED AUTOMATION (NOT INLCUDED)

DIVISION 26 ELECTRICAL

-Section 26 02 00 Low Voltage Transformers
Section 26 05 00 Common Work Result for Electrical
Section 26 05 11 Requirements for Electrical Installations

Section 26 05 13 Medium Voltage Cables
Section 26 05 19 Low Voltage Electrical Power Conductors and Cables
Section 26 05 26 Grounding and Bonding
Section 26 05 29 Hangers and Supports for Electrical Systems
Section 26 05 33 Raceways Boxes Fittings and Supports
Section 26 05 43 Underground Ducts and Raceways Electrical Systems
Section 26 05 44 Sleeves Sleeve Seals for Electrical Raceways and Cabling
Section 26 05 48 Vibration and Seismic Control for Electrical Systems
Section 26 05 53 Identification for Electrical Systems
Section 26 05 63 Electrical Testing
Section 26 05 72 Overcurrent Protective Device Short Circuit Study
Section 26 05 73 Overcurrent Protective Device Coordination Study
Section 26 08 00 Electrical Systems Commissioning
Section 26 09 23 Lighting Control Systems
Section 26 09 43 Network Lighting Control Systems
Section 26 13 13 Medium Voltage Metal Clad Switchgear
Section 26 13 16 Medium Voltage Fusible Interrupter Switch
Section 26 23 00 Low Voltage Switchgear
Section 26 24 13 Switchboards
Section 26 24 16 Panelboards
Section 26 25 00 Enclosed Bus Assemblies
Section 26 27 26 Wiring Devices
Section 26 28 13 Fuses
Section 26 28 16 Enclosed Switches and Circuit Breakers
Section 26 33 53 Static Uninterruptible Power Supply
Section 26 36 00 Automatic Transfer Switches
Section 26 43 13 Surge Protective Devices
Section 26 51 00 Interior Lighting
Section 26 53 00 Exit Signs
Section 26 56 00 Exterior Lighting

DIVISION 27 COMMUNICATIONS

Section 27 05 00 Common Work Results for Communications
Section 27 05 26 Grounding and Bonding for Communications Systems
Section 27 05 29 Hangers and Supports for Communication Systems Part
Section 27 05 33 Conduits and Backboxes for Communication Systems
Section 27 05 36 Cable Trays for Communications Systems
Section 27 05 39 Surface Raceways for Communications Systems
Section 27 05 43 Underground Ducts and Raceways for Communications Systems
Section 27 05 53 Identification for Communications Systems

Section 27 10 00 Structured Cabling, Basic Materials and Methods
Section 27 11 16 Communication Cabinets, Racks, Frames and Enclosures
Section 27 11 19 Communications Termination Blocks and Patch Panels
Section 27 11 23 Communications Cable Management
Section 27 13 00 Communications Indoor Backbone Cabling
Section 27 15 00 Communications Horizontal Cabling
Section 27 52 25 Portable Assistive Listening System

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

Section 28 10 00 Access Control System
Section 28 20 00 Video Surveillance
Section 28 31 00 Fire Alarm and Detection System

DIVISION 31 EARTHWORK

Section 31 22 00 Grading
Section 31 23 02 Excavation and Fill for Utilities
Section 31 23 04 Excavation and Fill for Structures
Section 31 25 00 Erosion and Sedimentation Controls

DIVISION 32 EXTERIOR IMPROVEMENTS

Section 32 12 16 Asphalt Concrete Paving
Section 32 13 13 Site Concrete Work
Section 32 17 00 Pavement Markings and Bumpers
Section 32 17 19 Pavement Markings and Wheel Stops
Section 32 17 26 Tactile Warning Surfacing
Section 32 31 19 Fabricated Decorative Metal Fences and Gates
Section 32 31 43 Automatic Gate Operators
Section 32 39 13 Manufactured Metal Bollards
Section 32 84 23 Irrigation System
Section 32 93 00 Plants

DIVISION 33 UTILITIES

Section 33 05 28 Underground Utilities Marking
Section 33 10 00 Site Water Distribution System
Section 33 30 00 Sanitary Sewage System
Section 33 40 00 Storm Drainage System

ATTACHMENTS

A. CEQA Notice of Exemption dated Augst 14, 2025
B. Geotechnical Investigation Report dated October 4, 2024, by Kleinfelder
C. Historic Report dated February 12, 2025, by Historic Resources Group
D. L.A. County Building Assessment: Torrance Health Center
E. L.A. County General Site Information
F. Low Impact Development (LID) Report dated June 16, 2025, by Barbara L. Hall, P.E., Inc.
G. Limited Hazardous Materials Validation Survey dated Mach 7, 2023, by Millennium Consulting Associates
H. Asbestos Survey dated September 5, 2002, by P&D Environmental
I. Southern California Edison (SCE) Preliminary Design Map
J. Topographic Survey dated February 16, 2023, by Pfeiler & Associates Engineers Inc.
K. Deductive Alternate Scope Descriptions
L. Record Drawings
    - L-1: Torrance Health Center 2006 Renovation Record Drawings dated August 1, 2006, by Steven Fader Architect
    - L-2: Torrance Health Center Record Drawings dated February 13, 2023, by La Canada Design Group
M. Compilation of Photos
N. Renderings – Material Board dated April 29, 2025, by La Canada Design Group
O. Approved Plans & Clearances
P. Pathway Torrance Community Health and Wellness Center Bid Set Drawings dated February 28, 2026, by La Canada Design Group

EXHIBITS

A. Countywide Community Workforce Agreement and Attachment Letter of Assent

SECTION 00 01 00

INSTRUCTIONS TO BIDDERS

This project includes the Countywide Community Workforce Agreement (CWA). Refer to EXHIBIT A.

PART 1 - GENERAL

1.01 COPIES OF BIDDING DOCUMENTS

a. Complete set of the Bidding Documents may be downloaded for free from the Los Angeles County Public Works website http://dpw.lacounty.gov/go/constructioncontracts.

b. Complete sets of Bidding Documents shall be used in preparing bids; the County does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

c. All Bidders for this solicitation are strongly encouraged to register at http://dpw.lacounty.gov/general/contracts/opportunities/. Only those Bidders registered for this solicitation through the DPW website will receive automatic notification when any update to this solicitation is made. **County does not have an obligation to notify any Bidders other than through the DPW website automatic notification system.**

d. Electronic Submission of Bid

Bids will only be accepted electronically through BidExpress, a secure online bidding service website, at www.bidexpress.com.

To submit the bid electronically, register with BidExpress, one week prior to the bid opening date. Once the Bidder is registered, an invitation will be sent to the Bidder to allow access to the solicitation on www.bidexpress.com. A Infotech/BidExpress Set-up Guide is included as an Enclosure for reference. There is a nominal service fee to use BidExpress.

Visit the Infotech Knowledge Center at the following link for more information: Bid Express® help guides. https://infotechinc.zendesk.com/hc/en-us/categories/360003900254-Bid-Express-at-www-bidexpress-com.

e. The bid opening will be held using Microsoft Teams, or County accepted platform. The information and link to access the bid opening will be posted on Public Works website, on the project information link. Any changes to this procedure will be issued in a Notice to Bidders for this project.

1.02 QUALIFICATIONS OF BIDDERS AND SUBCONTRACTORS

a. The Bidder and each listed subcontractor must have a valid license, issued by the Contractors' State License Board, for the type of work proposed to be performed by the Bidder and each listed subcontractor under the contract. The required license(s) is required at time of bid in order to be considered a responsive bid.

b. This project requires the Bidder to possess a license classification of “A or B" at time of bid.

c. In addition to Article 1.02, a. and b., the specifications set forth require specialty licenses, experience requirements, and required certifications from manufacturers concerning approved installers. The apparent successful Bidder shall be required to demonstrate to the County's satisfaction within 10 calendar days of the bid opening that the Bidder and proposed subcontractors (whether required to be listed or not) possess these specialty licenses, experience requirements, and required certifications.

d. All Bidders and their subcontractors must be registered with the Department of Industrial Relations. Qualified contractors and subcontractors are listed on searchable database at: https://services.dir.ca.gov/gsp.

1.03 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

a. Before submitting a bid, each Bidder must: a) examine the Contract Documents thoroughly; b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress, or performance of the Work; c) become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the Work; and d) study and carefully correlate Bidder's observations with the Contract Documents.

b. The submission of a bid will constitute an incontrovertible representation by the Bidder that Bidder has complied with every requirement of this Article and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

1.04 INTERPRETATIONS

a. All questions about the meaning or intent of the Contract Documents shall be submitted to the Department in writing. Replies will be issued by Notice to Bidders. Questions received less than ten (10) calendar days prior to the date for opening of bids will not be answered. Only questions answered by formal written notice will be binding. Oral and other interpretations or clarifications will be without legal effect.

b. Contact with County Personnel and Code of Silence Period

All contact regarding this solicitation or any matter relating thereto must be in writing and emailed to:

Attention Ms. Jennell Hluz, Contract Analyst
E-mail: jhluz@pw.lacounty.gov
Telephone: (626) 300-2362

If it is discovered that Bidder contacted and received information from any County personnel, other than the person specified above, regarding this solicitation, County, in its sole determination, may disqualify their bid from further consideration. This prohibition of contacting other County personnel, unless otherwise approved in writing and directed by Contract Analyst, as of the issue date of this solicitation and continuing until the date of award of Contract(s) will be referred to as the Code of Silence period.

1.05 BID SECURITY

a. Bid security is required of each Bidder and shall be made payable to Los Angeles County, in an amount of ten percent (10%) of the Bidder's bid price, in the form of cash, a certified check, a cashier's check, or a bid bond issued by a California-admitted Surety.

b. The bid security of the successful Bidder will be retained until such Bidder has executed the Agreement and contract security, whereupon it will be returned; if the successful Bidder fails to execute and deliver the Agreement and furnish the required insurance and contract security within fourteen (14) calendar days of notification from County, the County may annul the Notice of Award and the bid security of that Bidder may be forfeited. The bid security of any Bidder whom the County believes to have a reasonable chance of receiving the award may be retained until the earlier of the effective date of the contract or the ninety-first (91) day after bid opening. Bid security of other Bidders will be returned within thirty (30) days of the bid opening.

1.06 CONTRACT TIME

a. The number of days within which, or the date by which, the Work is to be completed (the contract time) is set forth in Section 01 00 00, "Project General Requirements." By submitting a bid, each Bidder agrees that the contract time is reasonable and the Bidder is capable of performing all Work within the contract time.

1.07 LIQUIDATED DAMAGES

a. Provisions for liquidated damages, if any, are set forth in Section 01 00 00, "Project General Requirements."

1.08 SUBSTITUTE MATERIAL AND EQUIPMENT

a. The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications unless the Bidder complied with the procedure for substitution of Equals as set forth in the General Conditions.

b. If any proposed substitution of an Equal is determined by the County to not be an Equal, the Contractor must complete the Work in accordance with the Drawings and Specifications for the accepted bid amount.

1.09 SUBCONTRACTORS

a. In accordance with Sections 4100 to 4113, inclusive of the Public Contract Code of the State of California, Contractors shall list, on the form provided, the name, license number, business location and classification of work for each subcontractor who will perform work, labor, or render service on the construction work in excess of one-half (1/2) of one percent (1%) of the total bid.

1.10 FORM OF BID

a. The Form of bid is attached hereto. Additional copies may be obtained from Contracts Administration Section, Business Relations and Contracts Division, 8th Floor.

b. The bid price of each item on the form must be stated in words and numerals; in case of a conflict, words will take precedence. Bid prices must be given for all bid items shown on the Form of Bid, including all additive alternatives. Failure to provide prices for all bid items may result in a determination by the County that the Form of Bid is nonresponsive.

c. Bids by corporations must be executed in the corporate name by the President or a Vice-President (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of corporation shall be shown below the signature.

d. Bids by partnership must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

e. All names must be typed or printed below the signature.

f. Bid Documents, Form of Bid, Section 00 03 00, must confirm receipt of any Notice to Bidders (if any).

1.11 SUBMITTAL OF BIDS

a. Bids will only be accepted electronically through BidExpress, a secure online bidding service website, at www.bidexpress.com. Bids shall be submitted at the time indicated in the Information for Bidders.

1. The following documents shall be submitted at the time of bid.

Required bid form documents:

- **Section 00 03 00 — Form of Bid**
- **Section 00 03 10 — Best Management Practices**
- **Section 00 03 11 — Construction and Demolition Debris Recycling Requirements**
- **Section 00 03 12 — Insurance Requirements**
- **Section 00 03 13 — LTWHP Jobs Coordinator**
- **Section 00 03 14 — Certification to Comply with Countywide Community Workforce Agreement (CWA) Form**
- **Section 00 03 15 — Cost Impact of Countywide Community Workforce Agreement (CWA) Form**
- **Section 00 04 00 — Attestation of Contractor's Qualifications**
- **Section 00 04 10 — Bid Bond (scanned copy)**
- **Section 00 04 30 — List of Subcontractors**
- **Section 00 04 38 — Request for Preference Consideration**
- **Section 00 04 38A — Subconsultant Certification Form**
- **Section 00 04 79 — Contribution and Agent Declaration Form-primary firm**

- **Section 00 04 87** **Certification of Compliance-Contact with County Personnel and Compliance with Code of Silence Period**

Failure to confirm receipt of any Notice to Bidder(s) provided to bidders on Form of Bid, Section 00 03 00, as required, may result in a determination that the apparent low bidder is nonresponsive and/or nonresponsible.

2. Original Bid Bond shall be mailed in within two (2) calendar days from the bid opening. This is required only from the first, second, and third apparent lowest bidders.

3. **The following document shall <u>not</u> be submitted at time of bid. Section 00 04 40, Equals, will only be required from the first, second, and third apparent lowest bidders and returned to the County no later than two (2) calendar days from the bid opening.**

   - **Section 00 04 40** **Equals**

b. No mention shall be made of sales tax or use tax, as all bid prices submitted will be considered as including such tax.

c. The County may consider nonresponsive any bid not prepared and submitted in accordance with the provisions herein and, therefore, reserves the right to reject any or all bids so submitted. The County also reserves the right to accept alternative bids when called for and when items are to be bid on as units, to accept the bid for the list of such items in its entirety, or to accept any portion or portions of same.

d. **The following documents shall <u>not</u> be submitted at the time of bid. These forms will be required only from the first, second, and third apparent lowest bidders and returned to the County no later than seven (7) calendar days from the bid opening.**

Section 00 04 35	**Community Business Enterprises (CBE) Participation Form.**
Section 00 04 50	**Noncollusion Affidavit**
Section 00 04 60	**Attestation of Willingness to Consider GAIN/GROW Participants**
Section 00 04 65	**3-Year Contracting History**
Section 00 04 70	**False Claims**
Section 00 04 71	**Civil Litigation History**
Section 00 04 72	**Criminal Convictions**
Section 00 04 73	**Debarment**

Section 00 04 74	**Labor Law/Prevailing Wage**
Section 00 04 75	**Integrated Pest Management Program Compliance Certification**
Section 00 04 76	**Charitable Contributions Certification**
Section 00 04 77	**Prospective Contractor List of Terminated Contracts**
Section 00 04 79	**Contribution and Agent Declaration Form-subconsultants/subcontractors**
Section 00 04 85	**Contractor Employee Jury Service Program-primary firm and subconsultants/subcontractors**
Section 00 04 90	**Contractor's Industrial Safety Record**
Section 00 04 91	**Injury and Illness Prevention Plan and Code of Safe Practices Affidavit**
Section 00 04 92	**Bidder's Organization Questionnaire/Affidavit**
Section 00 04 93	**Certification of Compliance with the County's Defaulted Property Tax Reduction Program**
Section 00 04 94	**Avoidance of Conflict of Interest**
Section 00 04 95	**Familiarity with the County Lobbyist Ordinance Certification**
Section 00 04 96	**Proposer's EEO Certification**
Section 00 04 97	**Compliance with Fair Chance Employment Hiring Practices Certification**
Section 00 04 98	**Zero Tolerance Human Trafficking Policy Certification**
Section 00 04 99	**Disallowed Cost Attestation**

e. Upon the County's request, each bidder agrees to provide the County with a cost breakdown of the bid in Construction Specification Institute (CSI) format. Failure to provide this information may result in a determination that the Bidder is nonresponsive and/or not responsible.

1.12 MODIFICATION AND WITHDRAWAL OF BIDS

a. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a bid must be executed) and delivered to the place where bids are to be submitted or by a Bidder's representative with proper identification and verification, at any time prior to the closing time for receipt of bids.

b. Relief of Bidders shall be as provided in Sections 5100-5107, inclusive, of the Public Contract Code of the State of California.

1.13 OPENING OF BIDS

a. Bids shall be opened publicly, read aloud, and the amount of the base bids and alternates (if any) shall be made available after the opening of bids.

b. Preliminary bids results will be posted on the same day on the Department of Public Works Website: http://dpw.lacounty.gov/general/contracts/opportunities/.

1.14 AWARD OF CONTRACT

a. If the County determines to award a contract, it shall be awarded to a responsive and responsible Bidder with the lowest bid price with preference to businesses that are certified by the County as a Local Small Business Enterprise, as set forth in Article 1.30 of these Instructions to Bidders. The lowest bid price shall be determined by adding the following items: Lump sum Bid in Words (1) + [Extended Overhead Daily Rate (2) multiplied by 30 days] + Deductive Alternate #1 (3) + Deductive Alternate #2 (4) + Deductive Alternate #3 (5) + Deductive Alternate #4 (6) + Deductive Alternate #5 (7) + Deductive Alternate #6 (8) = Total Lump Sum Bid. Preference as stated in Section 00 01 00, 1.30 will be applied to the Total Lump Sum Bid, if applicable, to determine the final bid amount. This does not preclude the Board of Supervisors from selecting any combination of alternates after the lowest responsible bidder has been determined. The Board of Supervisors reserves the right to reject any or all bids or to waive in the public interest technical errors and discrepancies in bids submitted.

b. The Board shall have the right to delay the award of the contract for 90 days after bids are opened and declared, unless otherwise agreed to by the County and Bidders. Bidders may withdraw their bids 91 calendar days after bids are publicly opened and declared by submitting written notice addressed to the Department. In evaluating bids, the County shall consider whether or not the bids comply with requirements, alternatives, and unit prices, if requested in the Form of Bid.

c. Extended Overhead Daily Rate

Extended Overhead Daily Rate is the sum of the Contractor's home office and field office overhead as applicable to this project.

The Bid Form contains an Extended Overhead Daily Rate which will be used to determine the additional compensation due the Contractor for each day of Compensable Delay. The number of days of Compensable Delay shown as a multiplier in the paragraph below is not intended as an estimate of the number of days of Compensable Delay, as defined in Section 00 07 00, General Conditions, Article 17.F.2 may be greater or lesser than the 30 days shown below.

The Extended Overhead Daily Rate in the Bid Form will be used in the evaluation of bids by multiplying the Extended Overhead Daily Rate times 30 days of Compensable Delay and adding it to the bidder's Lump Sum Bid price. However, the amount of the multiplied Extended Overhead Daily Rate for 30 days of Compensable Delay will not be included in the base contract amount.

d. Consultant Services Agreement

Following the determination of the successful bidder by the County, the County will issue a consultant services agreement for the preparation of the baseline construction schedule. The successful bidder shall return the signed consultant services agreement within three days of the County's issuance. Upon the County's receipt of the signed consultant services agreement, the County will authorize preparation of the Detailed Network Construction Schedule in accordance with Section 01 32 00, preparation of the Schedule of Values in accordance with Section 01 29 73, of the project specifications and preparation of the Storm Water Pollution Prevention Plan in accordance with Section 01 57 00. Only after acceptance by the County of the Detailed Network Construction Schedule in accordance with the minimum requirements set forth in Section 01 32 00, Construction Schedule; Section 01 29 73, Schedule of Values; Section 01 33 00, Submittals; Section 01 57 00, Storm Water Pollution Prevention Plan, and execution by the bidder of a contract for the entire project will the County execute a contract for the construction of the project.

Upon receipt by the County, of an acceptable Detailed Network Construction Schedule, Schedule of Values, list of Submittals and SWPPP, the Bidder shall receive payment of the sum of Five Thousand Dollars ($5000) as compensation to perform the work required to provide a Detailed Network Construction Schedule, Schedule of Values, list of Submittals and SWPPP. The payment of $5,000 shall be deducted from the overall construction contract base bid and shall not be in addition to it.

e. Failure to Produce Detailed Network Schedule, Schedule of Values, and SWPPP:

The Contractor must have or obtain expertise in the type of automated scheduling specified. The successful Bidder will have ten (10) calendar days from the issuance of a Notice to Proceed under the consultant services agreement to submit its Detailed Network Construction Schedule, Schedule of Values, and SWPPP. The successful Bidder will have three (3) calendar days to provide County requested revisions to the Detailed Network Construction Schedule, Schedule of Values, and SWPPP provided under the Consultant Services Agreement.

Submission of an acceptable Detailed Network Construction Schedule, Schedule of Values and SWPPP, is a condition precedent to the execution of the construction contract by the County. Failure to meet these requirements

may result in a determination and a recommendation that the Board of Supervisors determine that the successful Bidder is non-responsible because such failure reflects on the Bidder's ability to manage the work.

f. Execution of Contract by Bidder

Following bid opening and upon notification from Public Works, the apparent successful Bidder will be required to deliver within fourteen (14) calendar days to the offices of Public Works certificate(s) issued by the insurance carrier(s), payment and performance bonds, and three (3) signed and notarized contract signature pages. The contract pages must be signed by the corporate president and secretary, managing partner or sole proprietor.

g. Execution of Contract by County

When the Board of Supervisors or the Director has formally awarded the contract to the Successful Bidder, the County will execute the contract and issue the fully executed contract to the Contractor followed by the Notice to Proceed.

h. Failure to Resolve Equals

In accordance with the General Conditions, paragraph 2, subparagraph d, the first, second and third apparent lowest bidders will have two (2) calendar days after the bid opening to submit their list of Equals and ten (10) calendar days after the bid opening to submit all substantiating data and test results.

i. Protest Policy

The County will handle and process any and all protests in connection with this Bid according to the County of Los Angeles Contracting Manual, Countywide Construction Contracting Policy Guidelines, no. P-05-04, "Bid Protests", dated March 31, 2003. Bidders who wish to file a protest shall do so in accordance with the requirements specified in Construction Contracting Policy Guideline no. P-05-04, which can be found at http://dpw.lacounty.gov/general/bids/BidProtests.pdf

Policy Overview
The County of Los Angeles will process bid protests in a timely and consistent manner to assure that all prospective contractors/consultants are accorded fair and equal consideration for the award of County contracts.

Purpose and Scope
The purpose of this Policy Guideline is to convey the County's general course of action for addressing bid protests asserted by prospective contractors. This guideline will address the administrative guidelines for protests arising from the acquisition of construction and construction-related

services under both the Invitation for Bid (IFB) and Request for Proposal (RFP) methods of solicitation.

Application and Responsibility
This Policy Guideline applies to all County departments involved in the contractor selection process for construction and construction-related contracts.

Policy Guidelines

1. **Introduction.** Protests received by the County before contract award shall be immediately forwarded to the Contract Analyst issuing the IFB or RFP. The Contract Analyst will prepare a written response, reviewed by County Counsel if necessary, and approved by the department/agency head or his/her designee.

2. **Timely Filing**. The protest of a likely contract award to the apparent lowest bidder (IFB) or best-qualified firm or consultant (RFP) must be made prior to contract award. Untimely notice will not serve the interests of either party. Protests should be received by the County at the earliest practical time.

3. **Post-Award Protests.** With respect to protests received after contract award, the County will not suspend contract performance or terminate the awarded contract unless so directed by the Board.

4. **Protest Format.** The protesting party's protest should reference all pertinent County, State, Federal, or local laws or regulations that are relied upon in support of the protest. Any documents relevant to the protest should be submitted. The County, at its discretion, may decide the protest without requesting further submittal(s) from the party submitting the protest. Thus, the initial protest should include all matters that the party wishes the County to consider in deciding the protest outcome. Such matters include, but are not limited to, the following:
   (1) The name and address of the party and its relationship to the procurement.
   (2) Identification of the proposed project or contract.
   (3) Description of the nature of the protest.
   (4) Identification of the provision(s) of the solicitation, regulations, or laws upon which the protest is based (i.e., identification of the technical specifications or item of content in the IFB/RFP).
   (5) Copies of all (or any) documentation supporting the allegations in the protest.
   (6) Statement of the specific relief requested.

5. **Protest Submittal.** The best interests of the parties are served if the protest is (1) filed with the Contract Analyst, (2) filed in a timely fashion, and (3) filed in the format and detail described in Protest Format above. A contractor may also appear in person before the Board. The Board,

acting in the best interests of the County, may decide to continue with the award and acquisition subject to resolution of the protest.

6. **Protest Remedies.** A decision by the responsible official will be made based on the merits of the protest. A written response will be provided by the County and all findings and specified remedies will be considered final. The Board may suspend a contract upon a finding that the protest has merit and is based on solid legal principles.

7. **Authority for Administration of Protests.** The responsible official may assign Contract Analysts to conduct the administrative processing of protests filed with the County. Assigned Contract Analysts shall be responsible for proper distribution of protest submittals and responses, coordination of staff evaluation of the protest, compliance with the time limits stated herein, and maintenance of all documents related to the protest. The responsible official shall request County Counsel to review and advise the Contract Analyst concerning any legal issues involved in protests.

1.15 PERFORMANCE AND OTHER BONDS

a. The General Conditions and Supplementary Conditions set forth requirements as to performance bonds and other bonds. When the successful Bidder delivers the executed Agreement to the County, it shall be accompanied by the required contract security.

1.16 COMMUNITY BUSINESS ENTERPRISE (CBE) PARTICIPATION

a. The County encourages the participation of Community Business Enterprises (CBE) in the project and has established a goal of twenty-five percent (25%) CBE participation which all contractors must aspire to meet. Participation in the Work is based on total monetary value of the proposed subcontract. CBEs are defined as Minority/Women/Disadvantaged/Disabled Veteran/ Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning owned Business Enterprises (M/W/D/DVBE/LGBTQQ).

b. Bidders shall meet the established goal as indicated above. If the Bidder does not meet this established goal, Bidder shall document its good faith efforts to utilize CBEs. The Bidder shall submit the documentation of its good faith efforts to the County. County will evaluate the Bidder's good faith efforts to meet the CBE participation goal by the following criteria:

1. Bidder attended any pre-solicitation or pre-bid meetings scheduled by the County to inform all Bidders of the CBE program requirements for the Project.

2. Bidder identified and selected specific items of the Project for which the contract will be awarded to be performed by CBEs to provide an opportunity for participation by those enterprises.

3. Bidder advertised, not less than ten (10) calendar days before the date the bids are opened, in one or more daily or weekly newspaper trade association publications, minority- or trade-oriented publications, trade journals, or other media, specified by the local agency for CBEs that are interested in participating in the Project.

4. Bidder provided written notice of his or her interest in bidding on the contract to the CBEs required to be notified by the Project specifications not less than ten (10) calendar days prior to the opening of bids.

5. Bidder followed up initial solicitations of interest by contacting the enterprises to determine with certainty whether the enterprises were interested in performing specific items of the Project.

6. Bidder provided interested CBEs with information about the plans, specifications, and requirements for selected subcontracting or material supply work.

7. Bidder requested assistance from minority and women community organizations; minority and women contractor groups; local, state, or federal minority and women business assistance offices; or other organizations that provide assistance in the recruitment and placement of minority or women business enterprises, if any are available.

8. Bidder negotiated in good faith with the CBEs, and did not unjustifiably reject as unsatisfactory bids prepared by any CBE.

9. Where applicable, the Bidder advised and made efforts to assist interested CBEs in obtaining bonds, lines of credit, or insurance required by these Contract Documents.

10. Bidder's efforts to obtain CBE participation could reasonably be expected by the County to produce a level of participation sufficient to meet the goals and requirements of the County.

c. Bidder may request for a certified CBE listing via email the County of Los Angeles Office of Small Business at:

osb@dcba.lacounty.gov

For additional information, contact the County of Los Angeles Department of Consumer and Business Affairs (Small Business Services). The website is: dcba.lacounty.gov. The County of Los Angeles Certification Portal from the Office of Small business is at the same website for firms seeking County certification. **Information on this program and how to obtain certification are available on the County of Los Angeles Department of Economic Opportunity website: Office of Small Business | LA County AJCC, CA https://www.ajcc.lacounty.gov/businesses/office-of-small-business.**

d. Contractors, material, and services and supplies vendors interested in becoming registered as certified minority or women business enterprises may contact the County of Los Angeles Countywide Contract Compliance Section, at (626) 943-5619.

e. The first, second, and third apparent lowest bidders are required to submit documentation which describes the Bidder's good faith efforts to utilize CBEs within the timeframe indicated in Article 1.11 Submittal of Bids, paragraph d.

1.17 BEST MANAGEMENT PRACTICE (BMP) REQUIREMENTS

a. Contractor shall comply with the Los Angeles County Department of Public Works Construction Site Best Management Practices (BMP's) Manual, latest edition. A copy of the BMP Manual can be obtained at the Los Angeles County Department of Public Works Cashier's Office, 900 South Fremont Avenue, Alhambra, CA 91803, or call (626) 458-6959. Specific requirements for this Project are listed in Sections 00 03 10, 01 00 00, and 01 57 00.

b. Contractor shall use Construction and Demolition Debris Recycling Best Management Practices. Specific requirements are listed in Section 01 74 19. Copies of the Best Management Practices handbook are available at the Cashier's Office at the Department of Public Works at no cost to bidders.

1.18 RECYCLED BOND PAPER-CONTRACT LANGUAGE

Consistent with the Board of Supervisor's policy to reduce the amount of solid waste deposited at the County landfills, the Contractor agrees to use recycled content paper to the maximum extent possible on the project.

1.19 IMPROPER CONSIDERATIONS

a. Attempt to Secure Favorable Treatment

It is improper for any County officer, employee, or agent to solicit consideration, in any form, from a Bidder with the implication, suggestion or statement that the Bidder's provision of the consideration may secure more favorable treatment for the Bidder in the award of a Contract or that the

Bidder's failure to provide such consideration may negatively affect the County's consideration of the Bidder's submission. A Bidder must not offer or give either directly or through an intermediary, consideration, in any form, to a County officer, employee, or agent for the purpose of securing favorable treatment with respect to the award of a Contract.

b. Notification to County
A Bidder must immediately report any attempt by a County officer, employee, or agent to solicit such improper consideration. The report must be made to the Los Angeles County Fraud Hotline at (800) 544-6861 or https://fraud.lacounty.gov/. Failure to report such a solicitation may result in the Bidder's submission being eliminated from consideration.

c. Form of Improper Consideration
Among other items, such improper consideration may take the form of cash, discounts, services, the provision of travel or entertainment, or tangible gifts.

1.20 CONSIDERATION OF GAIN/GROW PROGRAM PARTICIPANTS FOR EMPLOYMENT

As a threshold requirement for consideration for contract award, Bidders/Proposers shall demonstrate a proven record of hiring the County's Department of Public Social Services' (DPSS) Greater Avenues for Independence (GAIN) or General Relief Opportunity for Work (GROW) participants or shall attest to a willingness to consider GAIN/GROW participants for any future employment opening if they meet the minimum qualifications for that opening. Additionally, Bidders/Proposers shall attest to a willingness to provide employed GAIN/GROW participants access to Bidders'/Proposers' employee mentoring program, if available, to assist these individuals in obtaining permanent employment and/or promotional opportunities.

The County will refer GAIN/GROW participants by job category to the Contractor. DPSS may be contacted at the following locations:

Central County	(323) 730-6452
East San Fernando Valley	(818) 729-8933
Palmdale-Lancaster	(661) 575-2646
Pomona	(909) 392-3071
San Gabriel Valley	(626) 927-2723
South County	(310) 603-8359
Southeast County	(323) 261-3065
West County	(310) 655-7725
West San Fernando Valley	(818) 718-4337

Bidders/Proposers who are unable to meet this requirement shall not be considered for contract award.

1.21 CHILD SUPPORT COMPLIANCE PROGRAM

Contractor is required to fully comply with all applicable state and federal reporting requirements relating to employment reporting for its employees. Contractor is required to fully comply with all lawfully served wage and earnings assignment orders and notices of assignment. Failure to comply with state and federal reporting requirements regarding employees, or failure to implement lawfully served wage and earnings assignment orders or notices of assignment, constitutes a default under the contract, and failure to cure the default within 90 days of notice by the County, shall subject the contract to termination. Failure to comply with these requirements may be cause for debarment.

1.22 FEDERAL EARNED INCOME CREDIT

Contractor shall notify its employees, and shall require each subcontractor to notify its employees, that they may be eligible for the Federal Earned Income Credit under the Federal income tax laws. Such notice shall be provided in accordance with the requirements set forth in Internal Revenue Service Notice 1015.

1.23 REDUCTION OF SOLID WASTE

Consistent with the Board of Supervisors' policy to reduce the amount of solid waste deposited at the County landfills, the Contractor agrees to use recycled-content paper to the maximum extent possible on the project.

1.24 INJURY AND ILLNESS PREVENTION PLAN (IIPP) AND CODE OF SAFE PRACTICES (CSP) AFFIDAVIT

The apparent low Bidder shall submit Section 00 04 91, INJURY and ILLNESS PREVENTION PLAN (IIPP) AND CODE OF SAFE PRACTICES (CSP) affidavit no later than seven (7) calendar days after the bid opening. The affidavit requires that the Bidder shall have an IIPP and a CSP which complies with Cal/OSHA Regulations, and that all subcontractors supplying employees to the jobsite will be required to prove to the Contractor that they have an IIPP and a CSP which complies with Cal/OSHA Regulations, and that their jobsite employees have been trained on IIPP and CSP.

Failure to submit this affidavit as required, may result in a determination that the apparent low Bidder is nonresponsive.

1.25 DETERMINATION OF BIDDER RESPONSIBILITY

a. A responsible Bidder is a Bidder who has demonstrated the attribute of trustworthiness, as well as quality, fitness, capacity and experience to satisfactorily perform the contract. It is the County's policy to conduct

business only with responsible consultants.

b. Bidders are hereby notified that, in accordance with Chapter 2.202 of the County Code, the County may determine whether the Bidder is responsible based on a review of the Bidder's performance on any contracts, including but not limited to County contracts. Particular attention will be given to violations of labor laws related to employee compensation and benefits, and evidence of false claims made by the Bidder against public entities. Labor law violations which are the fault of subcontractors and of which the Bidder had no knowledge shall not be the basis of a determination that the Bidder is not responsible.

c. The County may declare a Bidder to be non-responsible for purposes of this contract if the Board of Supervisors, in its discretion, finds that the Bidder has done any of the following: (1) violated a term of a contract with the County; (2) committed an act or omission which negatively reflects on the Bidder's quality, fitness or capacity to perform a contract with the County, any other public entity, or a nonprofit corporation created by the County, or engaged in a pattern or practice which negatively reflects on same; (3) integrity or business honesty; or (4) made or submitted a false claim against the County or any other public entity.

d. If there is evidence that the highest ranked Bidder may not be responsible, the Department shall notify the Bidder in writing of the evidence relating to the Bidder's responsibility, and its intention to recommend to the Board of Supervisors that the Bidder be found not responsible. The Department shall provide the Bidder and/or the Bidder's representative with an opportunity to present evidence as to why the Bidder should be found to be responsible and to rebut evidence which is the basis for the Department's recommendation.

e. If the Bidder presents evidence in rebuttal to the Department, the Department shall evaluate the merits of such evidence, and based on that evaluation, make a recommendation to the Board of Supervisors. The final decision concerning the responsibility of the Bidder shall reside with the Board of Supervisors.

f. The terms shall also apply to proposed subcontractors of Bidders on County contracts.

1.26 BIDDER DEBARMENT

a. The Bidder is hereby notified that, in accordance with Chapter 2.202 of the County Code, the County may debar the Bidder from proposing on, or being awarded, and/or performing work on other County contracts for a specified period of time, which generally will not exceed five years but may exceed five years or be permanent if warranted by the circumstances, and the County may terminate any or all of the Bidder's existing contracts with the County, if the Board of Supervisors finds, in it discretion, that the Bidder has done any of the following: (1) violated a term of a contract with the County or a

nonprofit corporation created by the County; (2) committed an act or omission which negatively reflects on the Bidder's quality, fitness or capacity to perform a contract with the County, any other public entity, or a nonprofit corporation created by the County, or engaged in a pattern or practice which negatively reflects on same; (3) committed an act or offense which indicates a lack of business integrity or business honesty; or (4) made or submitted a false claim against the County or any other public entity.

b. If there is evidence that the highest ranked Bidder may be subject to debarment, the Department shall notify the Bidder in writing of the evidence which is the basis for the proposed debarment, and shall advise the Bidder of the scheduled date for a debarment hearing before the Contractor Hearing Board.

c. The Contractor Hearing Board shall conduct a hearing where evidence on the proposed debarment is presented. The Bidder and/or the Bidder's representative shall be given an opportunity to submit evidence at that hearing. After the hearing, the Contractor Hearing Board shall prepare a tentative proposed decision, which shall contain a recommendation regarding whether the Bidder should be debarred, and, if so, the appropriate length of time of the debarment. The Bidder and the Department shall be provided an opportunity to object to the tentative proposed decision prior to its presentation to the Board of Supervisors.

d. After consideration of any objections, or if no objections are received, a record of the hearing, the proposed decision and any other recommendation of the Contractor Hearing Board shall be presented to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny or adopt the proposed decision and recommendation of the Contractor Hearing Board.

e. If a Bidder has been debarred for a period longer than five years, that Bidder may, after the debarment has been in effect for at least five years; submit a written request for review of the debarment determination to reduce the period of debarment or terminate the debarment. The County may, in its discretion, reduce the period of debarment or terminate the debarment if it finds that the Bidder has adequately demonstrated one or more of the following: (1) elimination of the grounds for which the debarment was imposed; (2) a bona fide change in ownership or management; (3) material evidence discovered after debarment was imposed; or (4) any other reason that is in the best interests of the County.

f. The Contractor Hearing Board will consider requests for review of a debarment determination only where (1) the Bidder has been debarred for a period longer than five years; (2) the debarment has been in effect for at least five years; and (3) the request is in writing, states one or more of the grounds for reduction of the debarment period or termination of the debarment, and includes supporting documentation. Upon receiving an appropriate request, the Contractor Hearing Board will provide notice of the hearing on the

request. After the hearing, the Contractor Hearing Board shall conduct a hearing where evidence on the proposed reduction of debarment period or termination of debarment is presented. This hearing shall be conducted and the request for review decided by the Contractor Hearing Board pursuant to the same procedures as for a debarment hearing.

The Contractor Hearing Board's proposed decision shall contain a recommendation on the request to reduce the period of debarment or terminate the debarment. The Contractor Hearing Board shall present its proposed decision and recommendation to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny, or adopt the proposed decision and recommendation of the Contractor Hearing Board.

g. These terms shall also apply to proposed subcontractors of Bidders on County contracts.

1.27 CONTRACTOR EMPLOYEE JURY SERVICE PROGRAM

The prospective contract is subject to provisions of the County's ordinance entitled Contractor Employee Jury Service ("Jury Service Program") as codified in Sections 2.203.010 through 2.203.090 of the Los Angeles County Code.

a. Unless Contractor has demonstrated to the County's satisfaction either that Contractor is not a "Contractor" as defined under the Jury Service Program (Section 2.203.020 of the County Code) or that Contractor qualifies for an exception to the Jury Service Program (Section 2.203.070 of the County Code), Contractor shall have and adhere to a written policy that provides that its Employees shall receive from the Contractor, on an annual basis, no less than five days of regular pay for actual jury service. The policy may provide that Employees deposit any fees received for such jury service with the Contractor or that the Contractor deduct from the Employee's regular pay the fees received for jury service.

b. For purposes of this Section, "Contractor" means a person, partnership, corporation or other entity which has a contract with the County or a subcontract with a County contractor and has received or will receive an aggregate sum of $50,000 or more in any 12-month period under one or more County contracts or subcontracts. "Employee" means any California resident who is a full-time employee of Contractor. "Full time" means 40 hours or more worked per week, or a lesser number of hours if the lesser number is a recognized industry standard and is approved as such by the County. If Contractor uses any subcontractor to perform services for the County under the Contract, the subcontractor shall also be subject to the provisions of this Section. The provisions of this Section shall be inserted into any such subcontract agreement and a copy of the Jury Service Program shall be attached to the agreement.

c. If a contractor does not fall within the Jury Service Program's definition of "Contractor" or if it meets any of the exceptions to the Jury Service Program, then the contractor must so indicate in the Certification Form and Application for Exception and include with its submission all necessary documentation to support the claim such as tax returns or a collective bargaining agreement, if applicable. Upon reviewing the contractor's application, the County will determine, in its sole discretion, whether the contractor falls within the definition of Contractor or meets any of the exceptions to the Jury Service Program. The County's decision will be final.

d. If a contractor is not required to comply with the Jury Service Program when the contract commences, the contractor will have a continuing obligation to review the applicability of its "exception status" from the Jury Service Program, and the contractor must immediately notify the County if the contractor at any time either comes within the Jury Service Program's definition of "contractor" or if the contractor no longer qualifies for an exception to the Program. In either event, the contractor must immediately implement a written policy consistent with the Jury Service Program. The County may also require, at any time during the contract and at its sole discretion, that a contractor demonstrate to the County's satisfaction that the contractor either continues to remain outside the Jury Service Program's definition of "Contractor" and/or the contractor continues to qualify for an exception to the Program.

e. If a contractor uses a subcontractor to perform services for the County under the contract, the subcontractor shall also be subject to the provisions of the Jury Service Program, unless the subcontractor 1) does not fall within the definition of "contractor" or 2) meets one of the exceptions to the Jury Service Program. The provisions of the Jury Service Program must be inserted into any applicable agreement and a copy of the Jury Service Program shall be attached to the agreement.

f. A contractor's violation of the Jury Service Program may constitute a material breach of the contract. In the event of such material breach, County may, in its sole discretion, terminate the contract and/or bar a contractor from the award of future County contracts for a period of time consistent with the seriousness of the breach.

1.28 VENDOR REGISTRATION WITH THE COUNTY OF LOS ANGELES

All potential bidders/proposers with the County of Los Angeles are required to register in WebVen and have a valid vendor number assigned to them. The vendor number is required by the Auditor-Controller and is necessary for any payments to be made to a contractor who is awarded a County project. Vendor registration can

be done online at http://camisvr.co.la.ca.us/webven or calling the County's Internal Service Department Central Purchasing Vendor Relations Unit at (323) 267-2650. If you are awarded a contract and you do not have a valid vendor number, your payments will be delayed until you are registered.

1.29 NO PAYMENT FOR SERVICES PROVIDED FOLLOWING EXPIRATION/TERMINATION OF AGREEMENT

Contractor shall have no claim against County for payment for any money or reimbursement, of any kind whatsoever, for any service provided by Contractor after the expiration or other termination of this Agreement. Should Contractor receive any such payment it shall immediately notify County and shall immediately repay all such funds to County. Payment by County for services rendered after expiration/termination of this Agreement shall not constitute a waiver of County's right to recover such payment from Contractor. This provision shall survive the expiration or other termination of this Agreement.

1.30 COUNTY'S PREFERENCE PROGRAM: LOCAL SMALL BUSINESS ENTERPRISE

Overview of County's Preference Program

The County of Los Angeles has The Local Small Business Enterprise (LSBE) preference program. The Board of Supervisors encourages business participation in the County's contracting process by continually streamlining and simplifying our selection process and expanding opportunities for these businesses to compete for County opportunities.

The LSBE Preference Program requires that a business must complete County of Los Angeles certification prior to requesting a preference in a solicitation. This program and how to obtain certification are further explained in this solicitation.

The maximum percentage of a LSBE Preference Program preference shall be 7 percent of the lowest responsible bidder meeting specifications and the maximum financial value shall be one hundred fifty thousand dollars ($150,000) for any bid.

Sanctions and financial penalties may apply to a business that knowingly, and with intent to defraud, seeks to obtain or maintain certification as a certified LSBE when not qualified.

a. **Local Small Business Enterprise (LSBE) Preference Program**

The County will give LSBE preference during the solicitation process to businesses that meet the definition of a LSBE, consistent with Chapter 2.204.030C.1 of the Los Angeles County Code. An LSBE is defined as a business: 1) certified by the State of California as a small business and has

had its principal place of business located in Los Angeles County for at least one year; or 2) certified as a small business enterprise with other certifying agencies pursuant to the Department of Consumer and Business Affair's (DCBA) inclusion policy that: a) has its principal place of business located in Los Angeles County, and b) has revenues and employee sizes that meet the State's Department of General Services requirements. The business must be certified by the Department of Consumer and Business Affairs as meeting the requirements set forth above prior to requesting the LSBE Preference in a solicitation.

To apply for certification as an LSBE, businesses should contact the County of Los Angeles Department of Consumer and Business Affairs at http://dcba.lacounty.gov

Certified LSBEs may only request the preference if the certification process has been completed and certification is affirmed. Businesses must complete and submit Section 00 04 38 Request for Preference Consideration Form and submit a letter of certification from the County of Los Angeles Department of Consumer and Business Affairs (DCBA) with their proposal. As shown on the County DCBA letter, the certification must be valid as of the bid due date.

Information about the State's small business enterprise certification regulations is in the California Code of Regulations, Title 2, Subchapter 8, Section 1896 et seq., and is also available on the California Department of General Services Office of Small Business Certification and Resources Web site at http://www.pd.dgs.ca.gov/smbus/default.

b. Should one or more of the Bidders request and be granted the Local Small Business Enterprise (LSBE) Preference, the bid amount shall be adjusted as follows:

Local Small Business Enterprise (LSBE) Preference: Seven percent of the lowest bid amount will be calculated, which shall not exceed $150,000, and that amount will be deducted from the bid amounts submitted by all LSBE bidders who requested and were granted the LSBE Preference.

The contract award will be the bidder's original bid price, not the price with preference(s) that is used for evaluation purposes.

Preference Program Enterprises (PPEs) - Prompt Payment Program

It is the intent of the County that Certified Preference Program Enterprises (PPEs) receive prompt payment for services they provide to County Departments. Prompt payment is defined as fifteen (15) calendar days after receipt of an approved, undisputed invoice which has been properly matched against documents such as a receiving, shipping, or services delivered report, or any other validation of receipt document consistent with Board Policy 3.035 (Preference Program Payment Liaison and Prompt Payment Program).

1.31 NOTICE TO EMPLOYEES REGARDING THE SAFELY SURRENDERED BABY LAW

The Contractor shall notify and provide to its employees, and shall require each subcontractor to notify and provide to its employees, a fact sheet regarding the Safely Surrendered Baby Law, its implementation in Los Angeles County, and how to safely surrender a baby. The fact sheet is available on the Internet at www.babysafela.org for printing purposes.

The Contractor acknowledges that the County places a high priority on the implementation of the Safely Surrendered Baby Law. The Contractor understands that it is the County's policy to encourage all County Contractors to voluntarily post the County's "Safely Surrendered Baby Law" poster in a prominent position at the Contractor's place of business. The County's Department of Children and Family Services will supply the Contractor with the poster to be used.

1.32 REQUIRED CERTIFICATION/DISCLOSURE

Bids must provide full disclosure on violations and civil/criminal legal actions as provided for on the bidding requirement forms Sections 00 04 70, 00 04 71, 00 04 72, 00 04 73, and 00 04 74. Failure to complete these forms may result in a determination that the Bidder is nonresponsive and/or not responsible.

1.33 NOTIFICATION TO COUNTY OF PENDING ACQUISITIONS/MERGERS BY BIDDING COMPANY

The Bidder shall notify the County of any pending acquisitions/mergers of its company unless otherwise legally prohibited from doing so. If the Bidder is restricted from legally notifying the County of pending acquisitions/mergers, then it should notify the County of the actual acquisitions/mergers as soon as the law allows and provide to the County the legal framework that restricted it from notifying the County prior to the actual acquisitions/mergers. This information shall be provided by the Bidder on Section 00 04 92 - Bidder's Organization Questionnaire/Affidavit. Failure of the Bidder to provide this information may eliminate its bid from any further consideration. Bidder shall have a continuing obligation to notify the County and update any changes to its response in Section 00 04 92 - Bidder's Organization Questionnaire/Affidavit during the solicitation.

1.34 COUNTY'S DEFAULTED PROPERTY TAX REDUCTION PROGRAM

The prospective contract is subject to the requirements of the County's Defaulted Property Tax Reduction Program (Los Angeles County Code, Chapter 2.206). Prospective contractors should carefully read the Defaulted Tax Program Ordinance and the pertinent provisions of the sample contract which are incorporated by reference into and made a part of this solicitation. The Defaulted Tax Program applies to both contractors and their subcontractors.

Bidders/proposers shall be required to certify that they are in full compliance with the provisions of the Defaulted Tax Program and shall maintain compliance during the term of any contract that may be awarded pursuant to this solicitation or shall certify that they are exempt from the Defaulted Tax Program by completing Certification of Compliance with the County's Defaulted Property Tax Reduction Program required forms. Failure to maintain compliance, or to timely cure defects, may be cause for termination of a contract or initiation or debarment proceedings against the non-compliant contractor (Los Angeles County Code, Chapter 2.202).

Bids/proposals that fail to comply with the certification requirements of the Defaulted Tax Program will be considered non-responsive and excluded from further consideration.

1.35 LOCAL AND TARGETED WORKER HIRE PROGRAM

Local and Targeted Worker Hire Program applies to this project.

A. At least 30 percent of total California construction labor hours worked on each project must be performed by a qualified Local Resident. Where allowable, contractors are encouraged to achieve higher participation levels for Local Residents.

B. At least 10 percent of total California hours worked shall be performed by County residents classified as a Targeted Worker facing barriers to employment. Hours worked by a Targeted Worker who is also a Local Resident may be applied towards the 30 percent Local Resident hire goal. A Target Worker is a resident of the County who has indices of career-limiting circumstances, specifically, one or more of the following:

1. Has a documented annual income at or below 100 percent of the Federal Poverty Level;
2. No high school diploma or GED;
3. A history of involvement with the criminal justice system;
4. Protracted unemployment (receiving unemployment benefits for at least 6 months);
5. Is a current recipient of government cash or food assistance benefits;
6. Is homeless or has been homeless within the last year;
7. Is a custodial single parent;
8. Is a former foster youth; or
9. Is a veteran, or is the eligible spouse of a veteran of the United States armed forces, under Section 2(a) of the Jobs for Veterans Act (38 U.S.C.4215[a]).
10. Eligible Migrant and seasonal farmworkers
11. English Language Learners
12. Older Individuals (55+)
13. Disabled

14. Individuals with Low Levels of Literacy
15. Multi-Craft Core Curriculum (MC3) program graduates.

C. A Local Resident is defined as an individual living within the Tier 1 or Tier 2 ZIP Codes of the County. Before employing worker(s) from Tier 2 ZIP Codes, the available pool of local residents whose primary place of residence is within Tier 1 ZIP Codes must first be exhausted. Tier 1 means ZIP Codes within five (5) miles of the proposed project site, and where the average percentage of households living below 200 percent of the Federal Poverty Level (FPL) is greater than the County average for such households. Tier 2 means any ZIP Codes within the County where the average percentage of households living below 200 percent of the FPL is greater than the County average for such households. This definition shall also apply to affordable housing projects and for privately financed developments located on County property.

D. Contractor shall comply with the provision required under the Local and Targeted Hire Program in the Agreement.

E. In addition, there shall be a **mandatory** requirement to use a Jobs Coordinator to be hired directly by the contractor, prior to the start of work on the project. The Jobs Coordinator is an independent third-party individual, entity, or employee with whom the Prime Contractor enters into a contract or employs to facilitate the implementation of the Local and Targeted Worker Hiring Requirements of this Agreement. The Jobs Coordinator may be selected from the approved Jobs Coordinators list available as Form 00 09 12-5. If the Prime Contractor utilizes an employee as a Jobs Coordinator, the Jobs Coordinator must be able to demonstrate or document to the County the minimum qualifications and/or experience to fulfill the duties and responsibilities as outlined in Sections 2.02 and 2.03.

F. Per State Labor Code, a minimum ratio of one apprentice hour for every five journeyman hours shall be enforced, and contractors shall strive to obtain half of all apprentice hours on the project be performed by Local and Targeted Workers. Hours worked by an apprentice who is also a Targeted Worker or a Local Resident may be applied towards the 30 percent Local Resident and/or the 10 percent Targeted Worker hire goals.

1.36 Contractor CARD Track/Monitoring Database

The County maintains the Contractor Alert Reporting Database (CARD), which is used to track/monitor poorly performing contractors. When a County department identifies a significant performance/non-compliance issue(s) with a contractor, the department will provide notice to the contractor and will give the contractor an opportunity to correct the issue(s). If the contractor does not take any appropriate steps to correct the issue(s), the County department will enter the contractor, along with any other relevant information pertaining to the contractor's performance issue(s), into CARD.

The information entered into CARD can be accessed by all County departments, and will be used, along with any other relevant information not included in CARD, in determining bidder responsibility. If a department reviews this information and determines that a finding of non-responsibility should be pursued, the department will adhere to the guidelines specified in the Los Angeles County Code Chapter 2.202, and the County's Implementation Procedures for Determinations of Contractor Non-Responsibility and Contractor Debarment.

1.37 Time Off for Voting

The Contractor shall notify its employees, and shall require each subcontractor to notify and provide to its employees, information regarding the time off for voting law (Elections Code Section 14000). Not less than 10 days before every statewide election, every Contractor and subcontractors shall keep posted conspicuously at the place of work, if practicable, or elsewhere where it can be seen as employees come or go to their place of work, a notice setting forth the provisions of Section 14000.

1.38 ADDITIONAL BIDDER REQUIREMENTS

a. A pre-bid conference and site visitation will be held on Tuesday, March 17th, 2026 at 10:00 am, at the project site to provide information regarding the project, bidding process and answer questions that potential bidders may have. Interested parties are requested to meet promptly at 2300 West Carson Street, Torrance CA 90501. Attendance is strongly encouraged but not mandatory.

b. NO ADDITIONAL REQUIREMENTS.

1.39 PUBLIC WORKS CONTRACTOR REGISTRATION PROGRAM

a. This project is a public work as defined in Section 1720 of the California Labor Code, and subject to compliance monitoring and enforcement by the Department of Industrial Relations (DIR).

b. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to requirements of Section 4104 of the California Public Contract Code, or engage in the performance of any contract for public works, unless currently registered with the Department of Industrial Relations and qualified to perform public work pursuant to California Labor Code Section 1725.5.

c. The County shall not accept any bid nor award any contract without proof of the contractor and subcontractor's current registration to perform the project. A copy of the confirmed registration from the Department of Industrial

Relations website (https://services.dir.ca.gov/gsp) must be attached in applicable part of the bid package. The bid submitted by an unregistered contractor shall be basis for considering the bid non-responsive [with limited exceptions from this requirement for bid purposes only under Labor Code Section 1771.1].

d. An inadvertent error in listing an unregistered subcontractor pursuant to Labor Code Section 1725.5 in a bid proposal shall be grounds for considering the bid non-responsive, unless:

(1) The subcontractor is registered prior to the bid opening.

(2) Within 24 hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in subparagraph (E) of paragraph (2) of subdivision (a) of Section 1725.5.

(3) The subcontractor is replaced by another registered subcontractor pursuant to Section 4107 of the Public Contract Code.

e. All contractors and subcontractors must furnish certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement) in a format prescribed by the Labor Commission.

f. The prime contractor is required to post job site notices prescribed below:

8 Calif. Code Reg. §16451(d):

"This public works project is subject to monitoring and investigative activities by the Compliance Monitoring Unit (CMU) of the Division of Labor Standards Enforcement, Department of Industrial Relations, State of California. This Notice is intended to provide information to all workers employed in the execution of the contract for public work and to all contractors and other persons having access to the job site to enable the CMU to ensure compliance with and enforcement of prevailing wage laws on public works projects.

"The prevailing wage laws require that all workers be paid at least the minimum hourly wage as determined by the Director of Industrial Relations for the specific classification (or type of work) performed by workers on the project. These rates are listed on a separate job site posting of minimum prevailing rates required to be maintained by the public entity which awarded the public works contract. Complaints concerning nonpayment of the required minimum wage rates to workers on this project may be filed with the CMU at any office of the

Division of Labor Standards Enforcement (DLSE).

Local Office Telephone Number:

Division of Labor Standards Enforcement Office
320 W. Fourth Street, Suite 450
Los Angeles, CA 90013
(213) 620-6330

"Complaints should be filed in writing immediately upon discovery of any violations of the prevailing wage laws due to the short period of time following the completion of the project that the CMU may take legal action against those responsible.

"Complaints should contain details about the violations alleged (for example, wrong rate paid, not all hours paid, overtime rate not paid for hours worked in excess of 8 per day or 40 per week, etc) as well as the name of the employer, the public entity which awarded the public works contract, and the location and name of the project.

"For general information concerning the prevailing wage laws and how to file a complaint concerning any violation of these prevailing wage laws, you may contact any DLSE office. Complaint forms are also available at the Department of Industrial Relations website found at http://www.dir.ca.gov/Public-Works/PublicWorks.html."

g. In addition, electronic certified payroll records must be submitted to the County through an online system designated by the County when requested by County.

1.40 MENTAL HEALTH SERVICES FOR CRITICAL INCIDENTS

In the event of a serious accident on the Project site, the Los Angeles County Department of Mental Health (DMH) will, if requested, respond. The response may be within a few hours or as long as a few days after the incident, depending on when the request was made. The services DMH will provide include crisis intervention, normalization of the stress response that survivors may be experiencing, stress management techniques and resources if the stress reactions increase in frequency or intensity. Requests for services may be made by calling the DMH Emergency Outreach Bureau Deputy Director, (213) 738-4924, during normal business hours or the ACCESS Center, (800) 854-7771, evenings, holidays, and weekends.

1.41 CONTRACTOR INDEPENDENCE/PROHIBITION FROM PARTICIPATION IN FUTURE SOLICITATION(S)

In accordance with Board Policy No. 5.090, Contractor Independence,

The County Board of Supervisors has adopted a countywide policy that prohibits any person, or any firm or any subsidiary of a firm (collectively "firm") from submitting a bid or proposal in any County solicitation process where the person or firm, assisted in the development of the solicitation document(s).

A Bidder/Proposer, or a Contractor or its subsidiary or Subcontractor ("Bidder/Proposer/Contractor"), is prohibited from submitting a bid or proposal in a County solicitation if the Bidder/Proposer/Contractor has provided advice or consultation for the solicitation. A Bidder/Proposer/Contractor is also prohibited from submitting a bid or proposal in a County solicitation if the Bidder/Proposer/Contractor has developed or prepared any of the solicitation materials on behalf of the County. A violation of this provision will result in the disqualification of the Bidder/Contractor/Proposer from participation in the County solicitation or the termination or cancellation of any resultant County contract.

1.42 CONTRACTOR INDEPENDENCE/PROHIBITION FROM PARTICIPATION IN FUTURE SOLICITATION(S)

In accordance with Board Policy No. 5.090, Contractor Independence,
The County Board of Supervisors has adopted a countywide policy that prohibits any person, or any firm or any subsidiary of a firm (collectively "firm") from submitting a bid or proposal in any County solicitation process where the person or firm, assisted in the development of the solicitation document(s).

A Bidder/Proposer, or a Contractor or its subsidiary or Subcontractor ("Bidder/Proposer/Contractor"), is prohibited from submitting a bid or proposal in a County solicitation if the Bidder/Proposer/Contractor has provided advice or consultation for the solicitation. A Bidder/Proposer/Contractor is also prohibited from submitting a bid or proposal in a County solicitation if the Bidder/Proposer/Contractor has developed or prepared any of the solicitation materials on behalf of the County. A violation of this provision will result in the disqualification of the Bidder/Contractor/Proposer from participation in the County solicitation or the termination or cancellation of any resultant County contract.

1.43 Background and Security Investigations

Background and security investigations of Contractor’s staff may be required at the discretion of the County as a condition of beginning and continuing work under any resulting Contract. The cost of background checks is the responsibility of the Contractor.

1.44 LOCAL SMALL BUSINESS ENTERPRISE/SOCIAL ENTERPRISE/DISABLED VETERANS BUSINESS ENTERPRISE UTILIZATION

Local Small Business Enterprise means a business that is certified by the County of Los Angeles as a Local Small Business Enterprise (Local SBE), consistent with Chapter 2.204 of the Los Angeles County Code.

1. When requested by the County, the contractor shall provide to the County via methods specified by the County, such as submission of electronic live

(or dynamic) data on invoices for the prime and all subcontractors using County-designated third party software system or to a County approved website, or other means of submitting expenditure information on subcontractors, including but not limited to the following information: the name, business address, California Contractor License number and telephone number/email address of each subcontractor who will perform work or labor for the contractor on the Project in an amount in excess of one-half of 1 percent of the contractor's total bid. In addition, the contractor shall be required to provide each of the specified subcontractors' Local SBE status (i.e., whether any of the listed subcontractors are Local SBE's), Social Enterprise (SE) status, and Disabled Veterans Business Enterprise status, and the proposed monetary amount of the work the subcontractor will perform on the Project. In addition, at the time of submittal of the final invoice, the contractor shall indicate, via methods specified by the County, the actual dollar amounts paid to each listed subcontractor who performed work on the project.

2. Contractor's failure to comply with the provisions of this Article is a material breach of the Agreement. The parties agree that it will be impracticable or extremely difficult to fix the extent of actual damages resulting from the failure to the Contractor to comply with this Article. The parties agree that under the current circumstances a reasonable estimate of such damages is specified in the Schedule for Liquidated Damages for Local Small Business Enterprise Utilization hereunder, and that the Contractor shall be liable to the County for said amounts.

   If in the judgment of the Director, or his/her designee, the Contractor is deemed to be in non-compliance with the terms and obligations assumed hereby, the Director or his/her designee, at his/her option, in addition to, or in lieu of, other remedies provided herein in this Agreement, may deduct and withhold liquidated damages from County's final payment to the Contractor as follows:

SCHEDULE FOR LIQUIDATED DAMAGES FOR LOCAL SMALL BUSINESS ENTERPRISE/SOCIAL ENTERPRISE/DISABLED VETERANS BUSINESS ENTERPRISE UTILIZATION

Final Invoice Price	Liquidated Damages
Up to $100,000	$50.00 plus 0.1% of contract amount
$100,001 to $500,000	$150.00 plus 0.07% of all over $100,000
Over $500,000	$430.00 plus 0.05% of all over $500,000

1.45 Proposer's Acknowledgement of County's Commitment to Zero Tolerance Human Trafficking

On October 4, 2016, the Los Angeles County Board of Supervisors approved a motion taking significant steps to protect victims of human trafficking by establishing a zero tolerance human trafficking policy. The policy prohibits contractors engaged in human trafficking from receiving contract awards or performing services under a County contract.

Contractors are required to complete 00 04 98 Zero Tolerance Human Trafficking Policy Certification, certifying that they are in full compliance with the County's Commitment to Zero Tolerance Human Trafficking provision as defined in "Compliance with County's Zero Tolerance Human Trafficking" in the Agreement. Further, contractors are required to comply with the requirements under said provision for the term of any contract awarded pursuant to this solicitation.

1.46 Claims

Notwithstanding Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, Section 9204 of the Public Contract Code shall apply to any claim by the Contractor in connection with the Project.

a) Upon receipt of a claim pursuant to Section 9204 of the Public Contract Code, the County will conduct a reasonable review of the claim and, within a period not to exceed 45 Days, provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, the Contractor and the County may, by mutual agreement, extend the aforementioned time period.

b) The Contractor shall furnish reasonable documentation to support the claim.

c) If Board approval is needed to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the claim, and the Board does not meet within the 45 Days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the County will have up to 3 Days following the next duly publicly noticed meeting of the Board after the 45-Day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.

d) Any payment due on an undisputed portion of the claim will be processed and made within 60 Days after the County issues its written statement. If the County fails to issue a written statement, paragraph (j) shall apply.

e) If the Contractor disputes the County’s written response, or if the County fails to respond to a claim issued pursuant to Section 9204 within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the County will schedule a meet and confer conference within 30 Days for settlement of the dispute.

f) Within 10 business days (Monday-Thursday) following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the County will provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is

undisputed. Any payment due on an undisputed portion of the claim will be processed and made within 60 Days after the County issues its written statement. Any disputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the County and the Contractor sharing the associated costs equally. The County and the Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside those established in Section 9204.

g) Mediation shall include any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in Section 9204.

h) Unless otherwise agreed to by the County and the Contractor in writing, the mediation conducted pursuant to Section 9204 shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

i) Section 9204 does not preclude the County from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under Section 9204 does not resolve the parties' dispute.

j) Failure by the County to respond to a claim from the Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of Section 9204 shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the County's failure to have responded to a claim, or its failure to otherwise meet the time requirements of Section 9204, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

k) Amounts not paid in a timely manner as required by Section 9204 will bear interest at 7 percent per annum.

l) If a Subcontractor or a lower tier Subcontractor lacks legal standing to assert a claim against the County because privity of the Contract does not exist, the Contractor may present to the County a claim on behalf of a Subcontractor or lower tier Subcontractor. A Subcontractor may request in writing, either on its own behalf or on behalf of a lower tier Subcontractor, that the Contractor present a claim for work which was performed by the Subcontractor or by a lower tier Subcontractor on behalf of the Subcontractor. The Subcontractor requesting that the claim be presented to the County shall furnish reasonable documentation to support the claim. Within 45 Days of receipt of this written request, the Contractor shall notify the Subcontractor in writing as to whether the Contractor presented the claim to the County and, if the original Contractor did not present the claim, provide the Subcontractor with a statement of the reasons for not having done so.

m) A waiver of the rights granted by Section 9204 is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the Contractor

and the County may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) the County may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of Section 9204, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in Section 9204.

1.47 Proposer's Acknowledgement of County's Commitment to Fair Chance Employment Hiring Practices

On May 29, 2018, the Los Angeles County Board of Supervisors approved a Fair Chance Employment Policy in an effort to remove job barriers for individuals with criminal records. The policy requires businesses that contract with the County to comply with fair chance employment hiring practices set forth in California Government Code Section 12952, Employment Discrimination: Conviction History (Section 12952).

Contractors are required to complete Compliance with Fair Chance Employment Hiring Practices Certification (Required Forms), certifying that they are in full compliance with Section 12952, as indicated in the Sample Contract. Further, contractors are required to comply with the requirements under Section 12952 for the term of any contract awarded pursuant to this solicitation.

1.48 Default Method of Payment: Direct Deposit or Electronic Funds Transfer (EFT)

The County, at its sole discretion, has determined that the most efficient and secure default form of payment for goods and/or services provided under an agreement/contract with the County shall be Electronic Funds Transfer (EFT) or direct deposit, unless an alternative method of payment is deemed appropriate by the Auditor-Controller (A-C).

Upon contract award or at the request of the A-C and/or the contracting department, the Contractor shall submit a direct deposit authorization request with banking and vendor information, and any other information that the A-C determines is reasonably necessary to process the payment and comply with all accounting, record keeping, and tax reporting requirements.

Any provision of law, grant, or funding agreement requiring a specific form or method of payment other than EFT or direct deposit shall supersede this requirement with respect to those payments.

Upon contract award or at any time during the duration of the agreement/contract, a Contractor may submit a written request for an exemption to this requirement. The A-C, in consultation with the contracting department(s), shall decide whether to approve exemption requests.

1.49 Disallowed Cost

If Proposer's compliance with a County contract has been reviewed by the Department of the Auditor-Controller within the last 10 years, Proposer must not have unresolved questioned costs identified by the Auditor-Controller, in an amount over $100,000.00, that are confirmed to be disallowed costs by the contracting County department, and remain unpaid for six months or more from the date of disallowance, unless such disallowed costs are the subject of current good faith negotiations to resolve the disallowed costs, in the opinion of the County.

1.50 Compliance with the County Policy of Equity

The consultant acknowledges that the County takes its commitment to preserving the dignity and professionalism of the workplace very seriously, as set forth in the County Policy of Equity (CPOE) (https://ceop.lacounty.gov/). The consultant further acknowledges that the County strives to provide a workplace free from discrimination, harassment, retaliation and inappropriate conduct based on a protected characteristic, and which may violate the CPOE. The consultant, its employees and subconsultants acknowledge and certify receipt and understanding of the CPOE. Failure of the consultant, its employees or its subconsultants to uphold the County's expectations of a workplace free from harassment and discrimination, including inappropriate conduct based on a protected characteristic, may subject the consultant to termination of contractual agreements as well as civil liability.

1.51 Integrated Pest Management (IPM) Program Compliance

1.51.1 The County of Los Angeles is a permittee to a National Pollutant Discharge Elimination System Permit (NPDES Permit) issued by the Los Angeles Regional Water Quality Control Board to reduce or eliminate pollutants moved into surface water through storm water management systems and facilities. One of the conditions of the NPDES Permit is the implementation of an Integrated Pest Management Program (IPM Program) crafted to reduce the impact of pesticides and fertilizers to surface water.

1.51.2 The prospective contract is subject to the requirements of the County's IPM Program. Two main components of the Program include a training component for contractor employees who apply pesticides on County owned or maintained property, as well as monthly and annual reporting to the Los Angeles County Department of Agricultural Commissioner/ Weights and Measures (ACWM).

1.51.3 Proposers are required to complete Integrated Pest Management Program Compliance Certification in Required Forms, acknowledging and certifying compliance with the County's Integrated Pest Management Program, Compliance with County's Integrated Pest Management Program in Sample Contract. Further, contractors are

required to comply with the requirements under said provision for the term of any contract awarded pursuant to this solicitation.

1.52 COVID-19 Vaccinations of County Contractor Personnel

When applicable and required by the County, the Contractor shall comply with all other applicable local, departmental, State, and federal laws, regulations, and requirements for COVID-19.

1.53 Contractor Development and Bonding Program

Contractor Development and Bonding Program (CDABP) - Administered by the Chief Executive Office of the County of Los Angeles for all County Construction Contracting Departments. The CDABP provides a broad range of contractor technical assistance, training, and support in qualifying for bonds, as well as contract financing for County awarded contracts. CDABP assistance is available to prime and subcontractors. The CDABP is a County funded resource designed to reduce the barriers to small and diverse firms seeking to bid and contract on County projects. For information on the CDABP, please contact Contract Analyst.

1.54 Application of Countywide Community Workforce Agreement

The Countywide Community Workforce Agreement (CWA) with the Los Angeles/Orange Counties Building and Construction Trades Council and its respective unions was fully executed on June 7, 2023. A copy of the Countywide CWA is included as **Exhibit A** of the Project Manual and will become an Exhibit in the final contract for this project. Countywide CWA will apply to this Project. The Contractor shall comply with all terms therein and shall be bound by the terms and conditions of the Countywide CWA applicable to the contractors for all Work on the Project for the entire duration of the Project. Countywide CWA shall be deemed incorporated in full into this agreement including, but not limited to, the provisions regarding the hiring of workers for the Project by the Contractor and all of its subcontractors of all tiers. Contractor shall execute and return to the County the Letter of Assent, attached to the Countywide CWA as Attachment A to the **Exhibit A**, at the time of contract execution and shall cause each of its subcontractors of all tiers to also execute and return to the County a copy of the Letter of Assent.

1.56 Contribution and Agent Declaration

Government Code Section 84308 requires a party to a contract proceeding to disclose any contribution of more than $500 made to a County officer within the preceding twelve (12) months by the party or their agent. State regulations require this disclosure to be made at the time an application is filed, and, if a contribution is made during the contract proceeding, within 30 days of making a contribution or on the date on which the party first appears before or communicates with the agency regarding the proceeding after

making the contribution, whichever is earliest. All Bidders are advised that they and all of their Subcontractors must complete and return as part of the bid, the **Contribution and Agent Declaration Form**. Bidders are further advised that they and their Subcontractors must update the Contribution and Agent Declaration Form throughout the pendency of the solicitation if a contribution is made after the initial disclosure when the proposal is submitted, and as requested at any time by the County prior to contract award. Failure by the Bidder or any Subcontractor(s) to complete and submit the required **Contribution and Agent Declaration Form**, and failure by the Bidder or any Subcontractor(s) to update the declaration as required by law or as otherwise requested by the County, may eliminate the proposal from further consideration and/or the Proposer may be disqualified from a contract award, as determined in the County's sole discretion. Further, all Bidders and their Subcontractors are prohibited under Government Code Section 84308 from making a contribution of more than $500 to a County officer for twelve (12) months after the date a final decision is made in the contract proceeding involving this solicitation.

1.57 Attachments

The following attachments shall become part of the bid documents:

A. CEQA Notice of Exemption dated Augst 14, 2025
B. Geotechnical Investigation Report dated October 4, 2024, by Kleinfelder
C. Historic Report dated February 12, 2025, by Historic Resources Group
D. L.A. County Building Assessment: Torrance Health Center
E. L.A. County General Site Information
F. Low Impact Development (LID) Report dated June 16, 2025, by Barbara L. Hall, P.E., Inc.
G. Limited Hazardous Materials Validation Survey dated Mach 7, 2023, by Millennium Consulting Associates
H. Asbestos Survey dated September 5, 2002, by P&D Environmental
I. Southern California Edison (SCE) Preliminary Design Map
J. Topographic Survey dated February 16, 2023, by Pfeiler & Associates Engineers Inc.
K. Deductive Alternate Scope Descriptions
L. Record Drawings
    - L-1: Torrance Health Center 2006 Renovation Record Drawings dated August 1, 2006, by Steven Fader Architect
    - L-2: Torrance Health Center Record Drawings dated February 13, 2023, by La Canada Design Group
M. Compilation of Photos
N. Renderings – Material Board dated April 29, 2025, by La Canada Design Group
O. Approved Plans & Clearances
P. Pathway Torrance Community Health and Wellness Center Bid Set Drawings dated February 28, 2026, by La Canada Design Group

Exhibits

A. Countywide Community Workforce Agreement and Attachment Letter of Assent

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Americans with Disabilities Act (ADA) Information

Individuals requiring reasonable accommodations may request written materials in alternate formats, physical accessibility accommodations, sign language interpreters or other reasonable accommodations by contacting our departmental Americans with Disabilities Act Coordinator at (626) 458-7337, from 7:30 a.m. to 5:00 p.m., Monday through Thursday (excluding holidays). Persons who are hearing impaired may make contact by first dialing the California Relay Service at 7-1-1. Requests should be made at least one week in advance to ensure availability. When making a reasonable accommodation request, please reference Business Relations and Contracts Division **[BRC-2]**.

* * *

_____ _____

Name of Bidder (Firm Name) Vendor Identification Number

SECTION 00 03 00

FORM OF BID TO BE USED BY BIDDERS

The undersigned bidder proposes to furnish all materials, labor, and equipment required for the construction to complete the Pathway Torrance Community Health and Wellness Center Renovation Project, in accordance with Drawings and Specifications 7669, including addenda thereto, if any, adopted by the Board of Supervisors, and on file in the office of the Board of Supervisors, as follows:

The lowest bid price shall be determined by adding the following items: Lump sum Bid in Words (1) + [Extended Overhead Daily Rate (2) multiplied by 30 days] + Deductive Alternate #1 (3) + Deductive Alternate #2 (4) + Deductive Alternate #3 (5) + Deductive Alternate #4 (6) + Deductive Alternate #5 (7) + Deductive Alternate #6 (8) = Total Lump Sum Bid. Preference as stated in Section 00 01 00, 1.30 will be applied to the Total Lump Sum Bid, if applicable, to determine the final bid amount.

1. LUMP SUM BID:

The lump sum bid for the complete scope of work, including Best Management Practices (BMP), Construction and Demolition Debris Recycling, and Mandatory Jobs Coordinator, in accordance with the Drawings and Specifications, will be:

($_____) (_____)

Lump sum bid in figures Lump sum bid in words

2. EXTENDED OVERHEAD DAILY RATE:

The daily rate for the sum of the Contractor's field office and home office overhead for each day of compensable delay, multiplied by 30 days, will be:

($_____) (_____)

(Daily rate) in figures (Daily rate) in words

3. **DEDUCTIVE ALTERNATE #1: Omit CCTV Cameras**

The lump sum bid amount reduction for the exclusion of the CCTV cameras and related equipment from the scope of work:

($ _____) (_____)
Amount in figures Amount in words

4. **DEDUCTIVE ALTERNATE #2: Omit television and mounting equipment in community room**

The lump sum bid amount reduction for the exclusion television and mounting equipment in the community room from the scope of work:

($ _____) (_____)
Amount in figures Amount in words

5. **DEDUCTIVE ALTERNATE #3: Reduce the number of EV Charging Stations**

The cost difference (delta) for the reduction from 8 fully connected Electric Vehicle Charging Station (EVCS) stalls to 2 EVCS stalls and 6 Electric Vehicle (EV) capable stalls will be as follows:

($ _____) (_____)
Amount in figures Amount in words

6. **DEDUCTIVE ALTERNATE #4: Relocate northern fence and gates**

The cost difference (delta) for the relocation of the fence and gates from the northern property line at back of sidewalk to the face of the building will be as follows:

($ _____) (_____)
Amount in figures Amount in words

7. DEDUCTIVE ALTERNATE #5: Omit north and south exterior break areas

The lump sum bid amount reduction for the exclusion of the north and south exterior break areas scope of work will be as follows:

($_____) (_____)
Amount in figures Amount in words

8. DEDUCTIVE ALTERNATE #6: Omit exterior community plaza area

The cost difference (delta) for the exclusion of the colored concrete paved plaza area and the installation of a concrete walkway to provide an accessible path of travel will be as follows:

($_____) (_____)
Amount in figures Amount in words

5. COUNTY PROGRAM PREFERENCE:

The Local Small Business Enterprise Program Preference is provided by the County for purposes of bid evaluation only, as specified in Article 1.30 of Section 00 01 00. If Bidder is a qualifying Local Small Business Enterprise, check "yes" in the box below. Bidder shall be certified by the County of Los Angeles Department of Economic Opportunity at time of bid. Section 00 04 38 Request for County Program Preference Consideration must be submitted at the time of bid with a copy of the certification letter issued by the County of Los Angeles Department of Economic Opportunity. If non-qualifying, check "no" in the appropriate box.

LSBE Certification for Federally Funded County Solicitations.

Yes ☐ No ☐

NOTE: Any alteration or addition to the Form of Bid may invalidate same. All blank spaces shall be filled out completely. Line out nonapplicable blanks. An incomplete form may invalidate bid. The County reserves the right to waive any informalities or to reject any or all bids or to accept any alternatives when called for.

I (We) certify that on _____, 20____, License No. _____, license classification(s) _____, was issued to me (us), in the name of _____, by the Contractors' State License Board, pursuant to California Statutes of 1929, as amended, and that said license has not been revoked.

Firm Ownership Information
Check where applicable:

1. ( ) Minority-Owned
   ( ) Woman-Owned
   ( ) Disadvantaged-Owned
   ( ) Disabled Veteran-Owned
   ( ) LGBTQQ-Owned

2. ( ) An individual
   ( ) A corporation. Name state or territory of Incorporation
   _____
   ( ) A copartnership
   ( ) A joint venture

Race/Ethnic Composition
For statistical purposes only.

( ) Black/African American
( ) Hispanic/Latino
( ) Asian or Pacific Islander
( ) Native Americans
( ) Subcontinent Asian
( ) White

If a copartnership or joint venture, list names of individuals comprising same below

_____
_____
_____

Date signed _____, 20_____

Place _____
City and State

Respectfully submitted,

_____
Firm Name (if applicable)

Bidder's address, E-mail address, and telephone:

_____
Number and Street

_____
City and State Zip Code

_____
Telephone

_____
Fax

_____
Signature and Print Name

_____
Title and E-mail Address

_____
Signature and Print Name

_____
Title and E-mail Address

SECTION 00 03 10

BEST MANAGEMENT PRACTICES (BMP) REQUIREMENTS

Best Management Practices (BMPs) shall be defined as any program, technology, process, siting criteria, operating method, measure or device which controls, prevents, removes, or reduces Storm Water pollution. The Contractor shall comply with the Los Angeles County Department of Public Works Construction Site Best Management Practices (BMP's) Manual, latest edition.

BMPs for contractor activities shall be continuously implemented throughout the year. BMPs for erosion and sediment control shall be implemented as required in Section 01 57 00. BMPs for erosion and sediment control shall also be implemented prior to the commencement of any contractor activity or construction operation.

The County, as a permittee, is subject to enforcement actions by the State Water Resources Control Board, Environmental Protection Agency, and private citizens. The County will assess the Contractor a penalty of $1,000 for each calendar day that the Contractor has not fully implemented the BMPs specified for the Contract and/or is otherwise in noncompliance with these provisions in accordance with Section 01 57 00. In addition, the County will deduct from the final payment due the Contractor, the total amount of any fines levied on the County, plus legal and staff costs, as a result of the Contractor's lack of compliance with these provisions and/or less than complete implementation of the specified BMPs.

Full compensation for the implementation of BMPs, including the construction, deployment, maintenance, removal, and the furnishing of all necessary labor, equipment, and materials, shall be considered as included in the bid price of the total lump sum price bid in Section 00 03 00.

The lump sum bid for the IMPLEMENTATION OF BMPs for construction work according to Exhibit A, Sections 01 00 00, 01 57 00, and 01 74 23 Specifications, will be:

($_____) (_____)

BMP's lump sum bid in figures BMP's lump sum bid in words

EXHIBIT A

Designation of a Fulltime Qualified SWPPP Practitioner (QSP)
And
a Qualified SWPPP Developer (QSD)

Name of Bidder _____
Project ID NO. _____

In accordance with Section 01 57 00 Provisions the Bidder shall submit with its bid the name of the QSP and QSD, their CASQA Certificate number, underlying certificate, and a copy of the CASQA certificate of the QSP and QSD that the Bidder proposes to use for preparing and implementing the Storm Water Pollution Prevention Plan (SWPPP) as required by the contract Special Provisions. This Section requires the QSP to be on the project fulltime during working hours and during qualifying rain events. **This requirement is more stringent than the Construction General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities.**

Failure to execute and return the signed "Designation of a Fulltime Qualified SWPPP Practitioner (QSP) and Qualified SWPPP Developer (QSD)" shall result in a recommendation to the Board that the Bidder be found non-responsive because failure to comply with this requirement reflects on the Bidder's ability to perform and manage the Work.

QSP Name	CASQA Certification No.	Underlying Certificate, e.g., CISEC, CESSWI

QSD Name	CASQA Certification No.	Underlying Certificate, e.g., PE, CPESC, etc.

This is to acknowledge that the undersigned, on behalf of their company, is fully aware to the above requirement of a Fulltime Qualified SWPPP Practitioner (QSP) and a Qualified SWPPP Developer (QSD), in accordance with Section 01 57 00.

I declare under penalty of perjury under the laws of the State of California that the information stated above is true and correct.

_____ _____
Bidder/Authorized Qualified Designee's Signature Date

_____ _____
Bidder/Authorized Qualified Designee's Name and Title Print Telephone Number

SECTION 00 03 11

CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING REQUIREMENTS

Contractor shall submit a Construction and Demolition Recycling and Reuse Plan (RRP) for any work done for or on behalf of the County to the Los Angeles County Department of Public Works, Environmental Programs Division in accordance with Part 2.2 of Section 01 74 19.

Full compensation for complying with the Construction and Demolition Debris Recycling Requirements, including the construction, removal, and the furnishing of all necessary labor, equipment, and materials, shall be included in the lump sum price bid.

The lump sum bid for COMPLYING WITH THE CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING REQUIREMENTS according to Section 01 74 19, will be:

($_____) (_____)
Lump sum bid in figures Lump sum bid in words

_____
Name of Bidder (Firm Name)

SECTION 00 03 12

INSURANCE REQUIREMENTS

The premium for the Builders Risk shall be included with the Lump Sum Bid, Section 00 03 00, and shall not be in addition to it.

Builders Risk:

Such coverage is required for this Project and shall supersede Section 00 07 00, Builder's Risk Course of Construction Insurance, Article 45, and shall:

1. Insure against damage from perils covered by the Causes-of-Loss Special Form (ISO form CP 10 30), and the perils of earthquake, flood, risk of transit loss, loss during storage (both onsite and offsite), and collapse during construction (without restricting collapse coverage to specified perils).

2. If Contractor's work involves testing air conditioning systems, boilers, pressure vessels, major machinery or major electrical panels, policy shall include coverage for such testing.

3. Be written on a completed-value basis and cover the entire value of the construction Project, including County-furnished materials and equipment, against loss or damage until completion and acceptance by the County.

   The amount for Builders Risk according to Section 00 08 00 of the Specifications, will be:

($_____) (_____)
Amount in figures Amount in words

_____
Name of Bidder (Firm Name)

SECTION 00 03 13

LOCAL AND TARGETED WORKER HIRE PROGRAM – MANDATORY JOBS COORDINATOR

The fee for the mandatory jobs coordinator shall be included with the Lump Sum Bid, Section 00 03 00, and shall not be in addition to it.

Mandatory Jobs Coordinator:

The County of Los Angeles has implemented a **mandatory** Local and Targeted Worker Hire Policy (LTWHP) which can be located in Section 00 09 12. There shall be a **mandatory** requirement to use a Jobs Coordinator to be hired directly by the contractor, prior to the start of work on the project. The Jobs Coordinator is an independent third-party individual, entity, or employee with whom the Prime Contractor enters into a contract or employs to facilitate the implementation of the Local and Targeted Worker Hiring Requirements of this Agreement.

($_____) (_____)
Fee Amount in figures Amount in words

Name of Jobs Coordinator_____

Address_____

Phone Number & Email_____

_____
Name of Bidder (Firm Name)

SECTION 00 03 14
CERTIFICATION TO COMPLY WITH COUNTYWIDE COMMUNITY WORKFORCE AGREEMENT (CWA) FORM

I certify on behalf of the Contractor as follows:

If selected as the Contractor on the Pathway Torrance Community Health and Wellness Center Renovation project:

Contractor, and all of its subcontractors of any tier, agree to be become a party to and accept the terms and conditions of the Countywide Community Workforce Agreement (CWA), entitled Countywide Community Workforce Agreement, dated June 7, 2023. A copy of the Countywide CWA is attached as Exhibit A. If awarded contract, Letter of Assent shall be signed by the Prime Contractor prior to the execution of the Contract.

Note: This statement is a Pass/Fail statement. Any bidders that will not verify a commitment to comply with the requirements of Countywide CWA shall not be selected.

_____ Dated:_____
Responsible Contractor Representative

_____
(Signature)

_____
(Company and Position of Signatory)

_____
Name of Bidder (Firm Name)

SECTION 00 03 15
COST IMPACT OF COUNTYWIDE COMMUNITY WORKFORCE AGREEMENT (CWA) FORM

Countywide Community Workforce Agreement:

The cost associated with the inclusion of the Countywide Community Workforce Agreement shall be included with the Lump Sum Bid, Section 00 03 00, and shall not be in addition to it.

Note: This Section 00 03 15 Form shall be submitted at the time of bid. If this form is not completed and submitted with the required bid documents, the bid shall be found nonresponsive and will not be considered for review.

(_____) (_____)
Countywide CWA Cost in figures Countywide CWA Cost in words

_____ _____
Responsible General Contractor Representative Date

_____
(Signature)

_____
(Company and Position of Signatory)

SECTION 00 04 00

ATTESTATION OF CONTRACTOR'S QUALIFICATIONS

General Contractor's Firm Name (as shown on bid): _____

As specified in the bidding documents, in order to qualify to bid on this project, the General Contractor must have completed within the last five years, a similar project involving building renovation and refurbishment for a public entity as a general contractor, with a contract value of at least $5,000,000 and a building area of at least 5,000 square feet.

The general contractor hereby certifies to the County of Los Angeles that it possesses the qualifying experience.

I declare under penalty of perjury, under the laws of the State of California, that the foregoing is true and correct to the best of my knowledge.

Executed this _____ day of _____, 2026 at _____
(Month) (City and State)

By: _____
(Signature of owner or officer of the General Contractor)

_____
(Title)

SECTION 00 04 00

ATTESTATION OF CONTRACTOR'S QUALIFICATIONS

The general contractor shall submit verification and justification of its qualifying experience on this County provided form as part of its bid submittal. Failure to submit the information at the time of bid and to meet requirements for qualifying experience may result in a determination by the County that the Bidder is non-responsive and/or not qualified.

The County will determine, in its sole discretion, whether or not the information provided meets the requirements for qualifying experience in order for the general contractor to be considered a qualified bidder for this project.

PROJECT 1:

Project Name	Total Square Footage	Owner Contact Name and Address	Owner Phone and Email Address	Final Contract Value	Date Completed

Project description:

_____

_____

_____

_____

_____

SECTION 00 04 10
BID BOND

KNOW ALL PERSONS BY THESE PRESENTS:

That we, _____
_____ (Bidder and Address)

as Principal and _____
_____ (Surety and Address)
as Surety, as held and firmly bound unto the County of Los Angeles, hereinafter called the County, in the penal sum of ten percent (10%) of the total amount of the bid of the Principal above named, submitted by said Principal to the County, for the work described below, for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION of this obligation of such that:

WHEREAS, the Principal has submitted the above-mentioned Bid to the County, for certain construction specifically described as follows, for which bids are to be opened on _____

_____ for _____
(date of bid opening) (description of work, including location, project name, and project ID as it appears on the bid)

_____

Now, THEREFORE, if the aforesaid Principal is awarded the contract and, within the time and manner required under the bidding or contract documents, after prescribed forms are presented to him for signature, enters into written contract, in the prescribed form, in accordance with the bids, and files the two bonds with the County, one to guarantee faithful performance and the other to guarantee payment for labor and materials, as required by the law, then this obligation shall be null and void; otherwise, it shall be and remain in full force and virtue.

In the event suit is brought upon this bond by the County and judgment is recovered, the Surety shall pay all costs incurred by the County in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, we have hereunto set our hands and seals on this _____ day of _____, 20_____.

_____
Principal

(SEAL) _____
Signature and Title

(SEAL) _____
Surety

_____
Signature and Title

SECTION 00 04 30

SUBCONTRACTOR LISTING AND SUBCONTRACTING

Prime Contractors shall be governed by the provisions of Sections 4100 to 4113, inclusive, of the Public Contract Code of the State of California and shall set forth in their bids, on forms provided for same, the name and California contractor license number of each Subcontractor who will perform work or labor or render service to the prime Contractor in or about the construction of the work or improvement in amount in excess of one-half (1/2) of one percent (1%) of the prime Contractor's total bid.

Failure by a prime Contractor to specify a Subcontractor for any portion of the work in excess of one-half (1/2) of one percent (1%) of the total bid constitutes an agreement between the prime Contractor and the County that he is fully qualified to perform that portion of the work himself and will perform that portion of the work himself.

No prime Contractor whose bid is accepted shall substitute any person as subcontractor in place of the subcontractor listed, nor shall any subcontract be assigned or transferred except as provided for in the above Sections of the Public Contract Code of the State of California.

Prime Contractors in violation of any of the provisions of Sections 4100 to 4113, inclusive, of the Public Contract Code of the State of California are subject to possible cancellation of contract and monetary penalties as well as disciplinary action by the Contractors' State License Board.

LIST OF SUBCONTRACTORS

The following is a list of the proposed subcontractors to whom I (we) propose to sublet a portion or portions of this work.

NAME	LICENSE NUMBER	LOCATION OF THE PLACE OF BUSINESS	CLASSIFICATION OF WORK TO BE EXECUTED	DIR REGISTRATION NUMBER AND EXPIRATION DATE

NAME	LICENSE NUMBER	LOCATION OF THE PLACE OF BUSINESS	CLASSIFICATION OF WORK TO BE EXECUTED	DIR REGISTRATION NUMBER AND EXPIRATION DATE

SECTION 00 04 35

COMMUNITY BUSINESS ENTERPRISES (CBE) PARTICIPATION FORM

Contractors are required to indicate their good faith effort in CBE participation by indicating on this form their proposed involvement on this project. CBEs are Minority/Women/Disadvantaged/Disabled Veteran/Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning owned Business Enterprises (MBE/WBE/DBE/DVBE/LGBTQQ).

LIST OF CBE PARTICIPATION

The following is a list of certified CBE subcontractors or suppliers to whom I (we) propose to sublet or procure a portion or portions of this work.

NAME/ADDRESS	TYPE OF WORK OR PRODUCT	INDICATE MBE/ WBE/DBE/ DVBE/LGBTQQ	PERCENTAGE OF TOTAL CONTRACT VALUE

NAME/ADDRESS	TYPE OF WORK OR PRODUCT	INDICATE MBE/ WBE/DBE/ DVBE/LGBTQQ	PERCENTAGE OF TOTAL CONTRACT VALUE

SECTION 00 04 38

REQUEST FOR PREFERENCE CONSIDERATION–LOW BID SOLICITATION

INSTRUCTIONS: Bidders requesting preference consideration must complete and include this form in their bid. **In order to qualify for preference, firm must be certified by the County of Los Angeles Department of Economic Opportunity (DEO). Please reference and ATTACH your Certification Letter issued by DEO to determine Federal/Non-Federal preference eligibility.**

☐ PREFERENCE NOT REQUESTED

OR

☐ PREFERENCE REQUESTED (SELECT ALL THAT APPLY) Preference		
Program		**Reference**
☐ Request for **Local Small Business Enterprise (LSBE) Program** Preference	☐ Certification for Non-Federally Funded County Solicitations ☐ Certification for Federally Funded County Solicitations	**LACC 2.204** **PCC 2002**
		_____
		_____

DECLARATION: I DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA THAT THE INFORMATION IS TRUE AND CORRECT.

PRIMARY FIRM NAME:_____

PRINT NAME: _____ **TITLE:** _____

SIGNATURE: _____ **DATE:** _____

LOS ANGELES COUNTY COMMUNITY BUSINESS ENTERPRISE (CBE) INFORMATION

TITLE	REFERENCE
1 FIRM/ORGANIZATION INFORMATION	The information requested below is for statistical purposes only. On final analysis and consideration of award, contractor/vendor will be selected without regard to race/ethnicity, color, religion, sex, national origin, age, sexual orientation or disability.
Total Number of Employees in California:	
Total Number of Employees (including owners). If the firm has more than one office location, all personnel from all offices must be included**:**	

Race/Ethnic Composition of Firm. Enter the make-up of Owners/Partners/Associate Partners into the following categories:

Race/Ethnic Composition	Owners/Partners/ Associate Partners		Percentage of how ownership of the firm is distributed	
	Male	Female	Male	Female
Black/African American			%	%
Hispanic/Latino			%	%
Asian or Pacific Islander			%	%
Native Americans			%	%
Subcontinent Asian			%	%
White			%	%

TITLE	REFERENCE
2 CERTIFICATION AS MINORITY, WOMEN, DISADVANTAGED, DISABLED VETERAN, AND LESBIAN, GAY, BISEXUAL, TRANSGENDER, QUEER, AND QUESTIONING-OWNED (LGBTQQ) BUSINESS ENTERPRISE	If your firm is currently certified as a minority, women, disadvantaged, disabled veteran or lesbian, gay, bisexual, transgender, queer, and questioning-owned business enterprise by a public agency, complete the following. ☐ **Check if not applicable**

Agency Name	Minority	Women	Disadvantaged	Disabled Veteran	LGBTQQ

SECTION 00 04 38 A Subconsultant Certification Form

1. Certification as Minority, Women, Disadvantaged, Disabled Veteran, and Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning-Owned Business Enterprises: If any of your subconsultants/subcontractors is currently certified as these certifications by a public agency, complete the following and attach a copy of the proof of certification. Also include County of Los Angeles Local Small Business Enterprise/Social Enterprise/Disabled Veteran Business Enterprise certified subconsultants/subcontractors. All Subcontractors/Subconsultants listed in the bid/proposal shall be listed below. (Make a copy of this form, if necessary).

	Subconsultant Name	Local Small Business Enterprise	Small Business Enterprise	Minority	Women-Owned	Disadvantaged Business	Disabled Veteran Business Enterprise	Social Enterprise	Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning-Owned Business Enterprise
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

2. Declaration: I declare under penalty of perjury under the laws of the State of California that the above information is true and accurate.

Print Name:	Authorized Signature	Title	Date

SECTION 00 04 40
EQUALS

The undersigned desires to use the material, product, thing, or service described below, as "an equal" to such items as specified. In accordance with the General Conditions, Paragraph 2, Sub-paragraph D, the first, second, and third apparent low bidder will have two (2) calendar days after the bid opening to submit their list of equals and ten (10) calendar days after the bid opening to submit all substantiating data and test results. In accordance with Sub-paragraph E, the County, in its sole discretion, shall determine whether the substantiating data demonstrates that “an equal” submittal(s) is equal in all respects to the item specified in the bid documents. If the County determines that “an equal” submittal(s) has not been substantiated to be equal in all respects, the item specified in the bid documents shall be furnished and/or installed by Contractor without modification of the bid amount or contract documents. If the County finds that “an equal” submittal(s) is equivalent to the respective item(s) specified in the bid documents, then the undersigned may furnish such item(s), together with all necessary labor, materials, equipment, and incidentals required to perform and complete the work.

Date _____, 20_____

Phone No. _____

_____
Contractor's Name

_____
Contractor’s Address

	Materials, apparatus, or equipment specified for which Bidder proposes "an equal." (Indicate where specified and page number.)	Complete description of the materials, apparatus, or equipment the Bidder desires to use as "an equal" and name of Subcontractor if different.
1.	_____	_____
	_____	_____
	_____	_____
	_____	_____
2.	_____	_____
	_____	_____
	_____	_____
	_____	_____

3.

4.

5.

6.

SECTION 00 04 50

NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER

State of California

ss.

County of

_____, being first duly sworn, deposes and says that he or she is _____ of _____ the party making the foregoing bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any Bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the Bidder or any other Bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other Bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the Bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____[date], at _____[city], _____[state].”

Signature

_____

Date

SECTION 00 04 60

ATTESTATION OF WILLINGNESS TO CONSIDER GAIN/GROW PARTICIPANTS

As a threshold requirement for consideration for contract award, Bidder/Proposer shall demonstrate a proven record for hiring GAIN/GROW participants or shall attest to a willingness to consider GAIN/GROW participants for any future employment opening if they meet the minimum qualifications for that opening. Additionally, Bidder/Proposer shall attest to a willingness to provide employed GAIN/GROW participants access to the Bidder/Proposer's employee mentoring program, if available, to assist these individuals in obtaining permanent employment and/or promotional opportunities.

To report all job openings with job requirements to obtain qualified GAIN/GROW participants as potential employment candidates, Bidder/Proposer shall email: GAINGROW@DPSS.LACOUNTY.GOV and BSERVICES@WDACS.LACOUNTY.GOV.

Bidder/Proposers unable to meet this requirement shall not be considered for contract award.

Bidder/Proposer shall complete all of the following information, sign where indicated below, and return this form with their proposal.

A. Bidder/Proposer has a proven record of hiring GAIN/GROW participants.

_____ YES (subject to verification by County) _____ NO

B. Bidder/Proposer is willing to provide DPSS with all job openings and job requirements to consider GAIN/GROW participants for any future employment openings if the GAIN/GROW participant meets the minimum qualifications for the opening. "Consider" means that Proposer is willing to interview qualified GAIN/GROW participants.

_____ YES _____ NO

C. Bidder/Proposer is willing to provide employed GAIN/GROW participants access to its employee-mentoring program, if available.

_____ YES _____ NO _____ N/A (Program not available)

Proposer's Organization: _____

Signature: _____

Print Name: _____

Title: _____ Date: _____

Telephone No: _____ Email: _____

SECTION 00 04 65 3-YEAR CONTRACTING HISTORY

LIST ALL CURRENT AND COMPLETED CONTRACTS WITH THE COUNTY FOR THE PAST THREE YEARS (Begin with the most recent project)

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

Contract Type/Description _____ Contract Number
Type of Work _____ _____
Department _____ Contract Amount
Address _____ $ _____
County Contact Name/Phone _____ / _____ Date of Contract
IF CONSTRUCTION
Architect Name/Phone _____ / _____ _____
Type of Facility _____

SECTION 00 04 70

FALSE CLAIMS

Bidders/Proposers shall provide either the certification requested below or the information requested on the next page. **Failure to certify or provide the requested information may result in a determination that the Bidder/Proposer is non-responsive. Failure to fully and accurately provide the requested certification or information may result in a determination that the Bidder/Proposer is not responsible.**

"False Claims Act", as used herein, is defined as either or both the Federal False Claims Act, 31 U.S.C. Sections 3729 et seq., and the California False Claims Act, Government Code Sections 12650 et seq.

FALSE CLAIMS ACT CERTIFICATION

If the Bidder/Proposer has no False Claims Act violations as described above, complete the following:

I,_____, hereby certify that neither
(print name of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

_____
(Bidder/Proposer name as shown on Bid/Proposal)

nor_____
(name of responsible managing person licensed by Contractors' State License Board)

has been determined by a court or tribunal of competent jurisdiction to have violated the False Claims Act as defined above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this_____ day _____at_____
(month and year) (city and state)

by_____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

FALSE CLAIMS ACT VIOLATIONS

With regard to any determinations by a tribunal or court of competent jurisdiction that the False Claims Act, as defined above, has been violated by (1) the Bidder/Proposer submitting this Bid/Proposal, including any person who is an officer of, or in a management position with, or has an ownership interest in the contracting entity which is submitting this Bid/Proposal, or (2) the qualifying person licensed by the State Contractors' License Board to perform the work described in the Bid/Proposal, including any such person when they were an officer, manager, owner, or responsible managing employee of a construction contractor other than the Bidder/Proposer submitting this Bid/Proposal, Bidder/Proposer shall provide on the following page labeled "False Claim Act Violations Information:" (1) the date of the determination of the violation, (2) the identity of tribunal or court and the case name or number, if any, (3) the identity of government contract or project involved, (4) the identity of government agency involved, 5) the amount of fine imposed, and (6) any exculpatory information of which the County should be aware.

FALSE CLAIMS ACT VIOLATIONS INFORMATION

(1) Date of determination of the violation:

_____

(2) Identity of tribunal or court and the case name or number, if any: _____

_____

(3) Government contract or project involved: _____

_____

_____

(4) Government agency involved: _____

_____

_____

(5) Amount of fine imposed: _____

(6) Exculpatory information: _____

_____

_____

_____

_____

_____

_____

_____

Declaration: I declare under penalty of perjury that the above information is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by_____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

SECTION 00 04 71
CIVIL LITIGATION HISTORY

Bidder/Proposer shall provide either the certification requested below or information requested on the next page. **Failure to provide such certification or information may result in a determination that the Bidder/Proposer is nonresponsive. Failure to fully and accurately provide the requested certification or information may result in a determination that the Bidder/Proposer is not responsible.**

For the two (2) years preceding the date of submittal of this Bid/Proposal, identify any civil litigation arising out of the performance of a construction contract within the State of California in which the (1) Bidder/Proposer submitting this Bid/Proposal, including any person who is an officer of, or in a management position with, or has an ownership interest in the contracting entity which is submitting this Bid/Proposal, or (2) the qualifying person licensed by the State Contractors' License Board to perform the work described in this Bid/Proposal, including any such person when they were an officer, manager, owner, or responsible managing employee of a construction contractor other than the Bidder/Proposer submitting this Bid/Proposal, was a named plaintiff or defendant in a lawsuit brought by or against the Owner. Do not include litigation which is limited solely to enforcement of mechanics' liens or stop notices. Provide on the following page labeled "Civil Litigation History Information:" (1) the name and court case identification number of each case, (2) the jurisdiction in which it was filed, and (3) the outcome of the litigation, e.g., whether the case is pending, a judgment was entered, a settlement was reached, or the case was dismissed. If a settlement was reached within the two years preceding the date of submittal of this Bid/Proposal, please provide the dollar value of the settled claim(s). The dollar value may be marked as confidential if Bidder/Proposer does not want the settlement information to be public record.

CIVIL LITIGATION CERTIFICATION

If the Bidder/Proposer has no civil litigation history to report as described above, complete the following:

I, _____, hereby certify that neither
(print name of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

_____
(Bidder/Proposer name as shown on Bid/Proposal)

nor _____
(name of responsible managing person licensed by the Contractors' State License Board)

has been involved in civil litigation as described above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this _____ day of _____at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

CIVIL LITIGATION HISTORY INFORMATION

(1) Name of Case: _____

_____

Court case identification number: _____

(2) Jurisdiction in which case was filed: _____

_____

(3) Outcome of the case: _____

_____

_____

_____

_____

(1) Name of Case: _____

_____

Court case identification number: _____

(2) Jurisdiction in which case was filed: _____

_____

(3) Outcome of the case: _____

_____

_____

_____

_____

Declaration: I declare under penalty of perjury that the above information is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

SECTION 00 04 72

CRIMINAL CONVICTIONS

Bidder/Proposer shall provide either the certification requested below or information requested on the next page. **Failure to provide such certification or information may result in a determination that the Bidder/Proposer is nonresponsive. Failure to fully and accurately provide the requested certification or information may result in a determination that the Bidder/Proposer is not responsible.**

For the five (5) years preceding the date this Bid/Proposal is due, identify on the following page any criminal conviction in any jurisdiction of the United States for a violation of law arising out of the performance of a construction contract (1) by the Bidder/Proposer submitting this Bid/Proposal, including any person who is an officer of, or in a management position with, or has an ownership interest in the contracting entity which is submitting this Bid/Proposal, or (2) by the qualifying person licensed by the State Contractors' License Board to perform the work described in the Bid/Proposal, including any such person when they were an officer, manager, owner, or responsible managing employee of a construction contractor other than the Bidder/Proposer submitting this Bid/Proposal. Provide on the following page labeled "Criminal Convictions Information:" (1) the date of conviction, (2) the name and court case identification number, (3) the identity of the law violated, (4) the identity of the prosecuting agency, (5) the contract or project involved, (6) the punishment imposed, and (7) any exculpatory information of which the Agency should be aware.

CRIMINAL CONVICTION CERTIFICATION

If the Bidder/Proposer has no criminal convictions to report as described above, complete the following:

I, _____, hereby certify that neither
(print name of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

_____
(Bidder/Proposer name as shown on Bid/Proposal)

nor _____
(name of responsible managing person licensed by the Contractors' State License Board)

has been convicted of a criminal violation as described above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this _____day of _____at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

CRIMINAL CONVICTIONS INFORMATION

(1) Date of conviction: _____

(2) Name of case: _____

Court case identification number: _____

(3) Identity of the law violated: _____

_____

(4) Identity of the prosecuting agency: _____

_____

(5) Contract or project involved: _____

_____

(6) Punishment imposed: _____

_____

_____

(7) Exculpatory information: _____

_____

_____

_____

_____

Declaration: I declare under penalty of perjury that the above information is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

SECTION 00 04 73

DEBARMENTS

Bidder/Proposer shall provide either the certification requested below or the information requested on the next page. **Failure to provide such certification or information may result in a determination that the Bidder/Proposer is nonresponsive. Failure to fully and accurately provide the requested certification or information may result in a determination that the Bidder/Proposer is not responsible.**

For the ten (10) years preceding the date this Bid/Proposal is due, identify on the following page any debarment by any Federal, State, or local public agency arising out of the performance of a construction contract (1) by the Bidder/Proposer submitting this Bid/Proposal, including any person who is an officer of, or in a management position with, or has an ownership interest in the contracting entity which is submitting this Bid/Proposal, or (2) by the qualifying person licensed by the Contractors' State License Board to perform the work described in the Bid/Proposal, including any debarment of any such person when they were an officer, manager, owner, or responsible managing employee of a construction contractor other than the Bidder/Proposer submitting this Bid/Proposal. Provide on the following page labeled "Debarment Information:" (1) the date of debarment and the duration of the debarment, (2) the project name or contract from which the debarment arose, (3) the identify of the debarring agency, (4) stated reason for debarment, and (5) any exculpatory information of which the Agency should be aware.

HISTORY OF DEBARMENT CERTIFICATION

If the Bidder/Proposer has no debarments to report as described above, complete the following:

I, _____, hereby certify that neither
(print name of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

_____
(Bidder/Proposer name as shown on Bid/Proposal)

nor _____
(name of responsible managing person licensed by Contractors' State License Board)

has been debarred as described above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by_____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

DEBARMENT INFORMATION

(1) Date and duration of debarment: _____

_____

(2) Project name or contract involved: _____

_____

(3) Debarring agency: _____

_____

(4) Stated reason for debarment: _____

_____

_____

_____

_____

(5) Exculpatory information: _____

_____

_____

_____

_____

_____

_____

Declaration: I declare under penalty of perjury that the above information is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by_____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

SECTION 00 04 74

LABOR LAW/PAYROLL VIOLATIONS

Bidder/Proposer shall provide the certification requested below or the information requested on the next page. **Failure to provide such certification or information may result in a determination that the Bidder/Proposer is nonresponsive. Failure to fully and accurately provide the requested certification or information may result in a determination that the Bidder/Proposer is not responsible.**

"Labor law/payroll violation" means for purposes of this disclosure a violation of the Davis-Bacon Act (40 USC section 276a) and/or a violation of California Labor Code sections 1720 through 1861 concerning the payment of prevailing wages, employment of apprentices and hours and working conditions.

For the three (3) years preceding the date this Bid/Proposal is due, identify on the following page any determination made by any Federal, State, or local public agency of a labor law/payroll violation arising out of the performance of a construction contract (1) by the Bidder/Proposer submitting this Bid/Proposal, including any person who is an officer of, or in a management position with, or has an ownership interest in the contracting entity which is submitting this Bid/Proposal, or (2) by the qualifying person licensed by the Contractors' State License Board to perform the work described in the Bid/Proposal, including any such person when they were an officer, manager, owner, or responsible managing employee of a construction contractor other than the Bidder/Proposer submitting this Bid/Proposal. Provide on the following page labeled "Labor Law/Payroll Violations Information:" (1) the date of the determination of the violation, (2) the case number, if any, or other identifying information for the proceeding, (3) the identity of the government contract or project involved, (4) the identity of the government agency involved, (5) the description of violation, (6) the amount of any civil wage and penalty assessment, and (7) any exculpatory information of which the Agency should be aware.

LABOR LAW/PAYROLL VIOLATION CERTIFICATION

If the Bidder/Proposer has no labor law/payroll violations to report as described above, complete the following:

I, _____, hereby certify that neither
(print name of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

_____
(Bidder/Proposer name as shown on Bid/Proposal)

nor_____
(name of responsible managing person licensed by Contractors' State License Board)

has been determined to have violated any Federal, State, or local labor laws as described above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

LABOR LAW/PAYROLL VIOLATIONS INFORMATION

(1) Date of violation determination: _____

(2) Case number: _____

(3) Government contract or project involved: _____

_____

_____

(4) Government agency involved: _____

_____

(5) Description of the violation (attach disposition letter): _____

_____

_____

_____

_____

(6) Amount of any civil wage and penalty assessment: _____

_____

_____

(7) Exculpatory information: _____

_____

_____

_____

_____

Declaration: I declare under penalty of perjury that the above information is true and correct.

Executed this _____ day of _____ at _____
(month and year) (city and state)

by _____
(signature of owner, officer, manager, or licensee responsible for submission of Bid/Proposal)

SECTION 00 04 75

INTEGRATED PEST MANAGEMENT PROGRAM COMPLIANCE CERTIFICATION

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:	Email address:	
Solicitation/Contract for	Services	

PROPOSER CERTIFICATION

The County of Los Angeles is a permittee to a National Pollutant Discharge Elimination System Permit (NPDES Permit) issued by the Los Angeles Regional Water Quality Control Board to reduce or eliminate pollutants moved into surface water through storm water management systems and facilities. One of the conditions of the NPDES Permit is the Integrated Pest Management Program (IPM Program) which was developed to reduce the impact of pesticides and fertilizers to surface water. Among other things, the IPM Program imposes requirements to County Purchasing and Contracting, which are outlined in Integrated Pest Management Program Compliance of the proposed Contract. The entire Countywide IPM Program is available at Los Angeles County Department of Agricultural Commissioner/ Weights and Measures (ACWM) and Home Page - Current - Integrated Pest Management (lacounty.gov)

Proposer acknowledges and certifies compliance with Integrated Pest Management Program Compliance of the proposed Contract and agrees that proposer or a member of its staff performing work under the proposed Contract will be in compliance, when applicable. Proposer further acknowledges that noncompliance with the County's IPM Program may result in rejection of any proposal, or cancellation of any resultant Contract, at the sole judgment of the County.

I declare under penalty of perjury under the laws of the State of California that the information herein is true and correct and that I am authorized to represent this company.

Print Name:	Title:
Signature:	Date:

SECTION 00 04 76

CHARITABLE CONTRIBUTIONS CERTIFICATION

_____
Company Name

_____
Address

_____
Internal Revenue Service Employer Identification Number

_____
California Registry of Charitable Trusts "CT" number (if applicable)

The Nonprofit Integrity Act (SB 1262, Chapter 919) added requirements to California's Supervision of Trustees and Fundraisers for Charitable Purposes Act which regulates those receiving and raising charitable contributions.

Check the Certification below that is applicable to your company.

☐ Proposer or Contractor has examined its activities and determined that it does not now receive or raise charitable contributions regulated under California's Supervision of Trustees and Fundraisers for Charitable Purposes Act. If Proposer engages in activities subjecting it to those laws during the term of a County contract, it will timely comply with them and provide County a copy of its initial registration with the California State Attorney General's Registry of Charitable Trusts when filed.

OR

☐ Proposer or Contractor is registered with the California Registry of Charitable Trusts under the CT number listed above and is in compliance with its registration and reporting requirements under California law. Attached is a copy of its most recent filing with the Registry of Charitable Trusts as required by Title 11 California Code of Regulations, sections 300-301 and Government Code sections 12585-12586.

_____ _____
Signature Date

_____
Please Print Name and Title of Signer

PROSPECTIVE CONTRACTOR LIST OF TERMINATED CONTRACTS

Contractor's Name: _____

Proposer must list all contracts that have been terminated within the past three years. Terminated contracts are those contracts terminated by an agency or firm before the contract's expiration date. Any and all terminated contracts should be accompanied with "Reason for termination". It should be noted that contracts that naturally expired need not be listed. The County is only seeking information on contracts that were terminated prior to expiration.

1. Name of Firm	**Address of Firm**	**Contact Person**	**Telephone #** ( )	**Email**
Name or Contract No.	Reason for Termination:			
2. Name of Firm	**Address of Firm**	**Contact Person**	**Telephone #** ( )	**Email**
Name or Contract No.	Reason for Termination:			
3. Name of Firm	**Address of Firm**	**Contact Person**	**Telephone #** ( )	**Email**
Name or Contract No.	Reason for Termination:			
4. Name of Firm	**Address of Firm**	**Contact Person**	**Telephone #** ( )	**Email**
Name or Contract No.	Reason for Termination:			

REQUIRED FORM

CONTRIBUTION AND AGENT DECLARATION FORM

This form must be completed separately by all bidders/proposers, including all prime contractors and subcontractors, and by all applicants for licenses, permits, and other entitlements for use issued by the County of Los Angeles ("County").

Pursuant to the Levine Act (Government Code section 84308), a member of the Board of Supervisors, other elected County officials (the Sheriff, Assessor, and the District Attorney), and other County employees and/or officers ("County Officers") are disqualified and not able to participate in a proceeding involving contracts, franchises, licenses, permits and other entitlements for use if the County Officer received more than $500 in contributions in the past 12 months from the bidder, proposer or applicant, any paid agent of the bidder, proposer, or applicant, or any financially interested participant who actively supports or opposes a particular decision in the proceeding.

State law requires you to disclose information about contributions made by you, your company, and lobbyists and agents paid to represent you. Failure to complete the form in its entirety may result in significant delays in the processing of your application and potential disqualification from the procurement or application process.

You must fully answer the applicable questions below. You ("Declarant"), or your company, if applicable, including all entities identified below (collectively, "Declarant Company") must also answer the questions below. The term "employee(s)" shall be defined as employees, officers, partners, owners, or directors of Declarant Company.

An affirmative response to any questions will not automatically cause the disqualification of your bid/proposal, or the denial of your application for a license, permit or other entitlement. However, failure to answer questions completely, in good faith, or providing materially false answers may subject a bidder/proposer to disqualification from the procurement.

This material is intended for use by bidders/proposers, including all prime contractors and subcontractors, and by all applicants for licenses, permits, and other entitlements for use issued by the County of Los Angeles and does not constitute legal advice*. If you have questions about the Levine Act and how it applies to you, you should call your lawyer or contact the Fair Political Practices Commission for further guidance.*

REQUIRED FORM
CONTRIBUTION AND AGENT DECLARATION FORM

Complete each section below. State "none" if applicable.

A. COMPANY OR APPLICANT INFORMATION

1) Declarant Company or Applicant Name:

   a) If applicable, identify all subcontractors that have been or will be named in your bid or proposal:

   b) If applicable, variations and acronyms of Declarant Company's name used within the past 12 months:

   c) Identify all entities or individuals who have the authority to make decisions for you or Declarant Company about making contributions to a County Officer, regardless of whether you or Declarant Company have actually made a contribution:

[IF A COMPANY, ANSWER QUESTIONS 2 - 3]

2) Identify only the Parent(s), Subsidiaries and Related Business Entities that Declarant Company has controlled or directed, or been controlled or directed by. "Controlled or directed" means shared ownership, 50% or greater ownership, or shared management and control between the entities.

   a) Parent(s):

   b) Subsidiaries:

   c) Related Business Entities:

3) If Declarant Company is a closed corporation (non-public, with under 35 shareholders), identify the majority shareholder.

4) Identify all entities (proprietorships, firms, partnerships, joint ventures, syndicates, business trusts, companies, corporations, limited liability companies, associations, committees, and any other organization or group of persons acting in concert) whose contributions you or Declarant Company have the authority to direct or control.

5) Identify any individuals such as employees, agents, attorneys, law firms, lobbyists, and lobbying firms who are or who will act on behalf of you or Declarant Company and who will receive compensation to communicate with a County Officer regarding the award or approval of **this** contract or project, license, permit, or other entitlement for use.

   *(Do **not** list individuals and/or firms who, as part of their profession, either (1) submit to the County drawings or submissions of an architectural, engineering, or similar nature, **or** (2) provide purely technical data or analysis, **and** who will not have any other type of communication with a County agency, employee, or officer.)*

6) If you or Declarant Company are a 501(c)(3) non-profit organization, identify the compensated officers of your organization and the compensated members of your board.

B. CONTRIBUTIONS

1) Have you or the Declarant Company solicited or directed your employee(s) or agent(s) to make contributions, whether through fundraising events, communications, or any other means, to a County Officer in the past 12 months? If so, provide details of each occurrence, including the date.

Date (contribution solicited, or directed)	**Recipient Name** (elected official)	**Amount**

*Please attach an additional page, if necessary.

2) Disclose all contributions made by you or any of the entities and individuals identified in Section A to a County officer in the past 12 months.

Date (contribution made)	**Name** (of the contributor)	**Recipient Name** (elected official)	**Amount**

*Please attach an additional page, if necessary.

REQUIRED FORM

CONTRIBUTION AND AGENT DECLARATION FORM

C. DECLARATION

By signing this Contribution and Agent Declaration form, you (Declarant), or you and the Declarant Company, if applicable, attest that you have read the entirety of the Contribution Declaration and the statements made herein are true and correct to the best of your knowledge and belief. (Only complete the one section that applies.)

There are _____ additional pages attached to this Contribution Declaration Form.

COMPANY BIDDERS OR APPLICANTS

I, _____ (Authorized Representative), on behalf of _____(Declarant Company), at which I am employed as _____ (Title), attest that after having made or caused to be made a reasonably diligent investigation regarding the Declarant Company, the foregoing responses, and the explanation on the attached page(s), if any, are correct to the best of my knowledge and belief. Further, I understand that failure to answer the questions in good faith or providing materially false answers may subject Declarant Company to consequences, including disqualification of its bid/proposal or delays in the processing of the requested contract, license, permit, or other entitlement.

IMPORTANT NOTICE REGARDING FUTURE AGENTS AND FUTURE CONTRIBUTIONS:

By signing this Contribution and Agent Declaration form, you also agree that, if Declarant Company hires an agent, such as, but not limited to, an attorney or lobbyist during the course of these proceedings and will compensate them for communicating with the County about this contract, project, permit, license, or other entitlement for use, you agree to inform the County of the identity of the agent or lobbyist and the date of their hire. You also agree to disclose to the County any future contributions made to members of the County Board of Supervisors, another elected County officer (the Sheriff, Assessor, and the District Attorney), or any other County officer or employee by the Declarant Company, or, if applicable, any of the Declarant Company's proposed subcontractors, agents, lobbyists, and employees who have communicated or will communicate with the County about this contract, license, permit, or other entitlement after the date of signing this disclosure form, and within 12 months following the approval, renewal, or extension of the requested contract, license, permit, or entitlement for use.

_____ _____

Signature Date

REQUIRED FORM

CONTRIBUTION AND AGENT DECLARATION FORM

INDIVIDUAL BIDDERS OR APPLICANTS

I, _____, declare that the foregoing responses and the explanation on the attached sheet(s), if any, are correct to the best of my knowledge and belief. Further, I understand that failure to answer the questions in good faith or providing materially false answers may subject me to consequences, including disqualification of my bid/proposal or delays in the processing of the requested license, permit, or other entitlement.

IMPORTANT NOTICE REGARDING FUTURE AGENTS AND FUTURE CONTRIBUTIONS:

If I hire an agent or lobbyist during the course of these proceedings and will compensate them for communicating with the County about this contract, project, permit, license, or other entitlement for use, I agree to inform the County of the identity of the agent or lobbyist and the date of their hire. I also agree to disclose to the County any future contributions made to members of the County Board of Supervisors, another elected County official (the Sheriff, Assessor, and the District Attorney), or any other County officer or employee by me, or an agent such as, but not limited to, a lobbyist or attorney representing me, that are made after the date of signing this disclosure form, and within 12 months following the approval, renewal, or extension of the requested contract, license, permit, or entitlement for use.

_____ _____

Signature Date

SECTION 00 04 85
COUNTY OF LOS ANGELES CONTRACTOR EMPLOYEE JURY SERVICE PROGRAM
APPLICATION FOR EXCEPTION AND CERTIFICATION FORM

The County's solicitation for this contract/purchase order (Request for Proposal or Invitation for Bid) is subject to the County of Los Angeles Contractor Employee Jury Service Program (Program), Los Angeles County Code, Chapter 2.203. All bidders or proposers, whether a contractor or subcontractor, must complete this form to either: 1) request an exception from the Program requirements; or 2) certify compliance. Upon review of the submitted form, the County department will determine, in its sole discretion, whether the bidder or proposer is exempted from the Program.

Company Name:		
Company Address:		
City:	**State:**	**Zip Code:**
Telephone Number:		
Solicitation For (Type of Goods or Services):		

If you believe the Jury Service Program does not apply to your business, check the appropriate box in Part I (attach documentation to support your claim); or, complete Part II to certify compliance with the Program. Whether you complete Part I or II, please sign and date this form below.

Part I: Jury Service Program is not Applicable to my Business

- ❑ My business does not meet the definition of "contractor," as defined in the Program as it has not received an aggregate sum of $50,000 or more in any 12-month period under one or more County contracts or subcontracts (this exception is not available if the contract/purchase order itself will exceed $50,000). I understand that the exception will be lost and I must comply with the Program if my revenues from the County exceed an aggregate sum of $50,000 in any 12-month period.

- ❑ My business is a small business as defined in the Program. It: 1) has ten or fewer employees; and, 2) has annual gross revenues in the preceding 12 months which, if added to the annual amount of this contract, are $500,000 or less; and 3) is not an affiliate or subsidiary of a business dominant in its field of operation as defined below. I understand that the exemption will be lost and I must comply with the Program if the number of employees in my business and my gross annual revenues exceed the above limits.

  "**Dominant in its field of operation**" means having more than ten employees, including full-time and part-time employees, and annual gross revenues in the preceding 12 months, which, if added to the annual amount of the contract awarded, exceed $500,000.

  "**Affiliate or subsidiary of a business dominant in its field of operation"** means a business which is at least 20 percent owned by a business dominant in its field of operation, or by partners, officers, directors, majority stockholders, or their equivalent of a business dominant in that field of operation.

- ❑ My business is subject to a Collective Bargaining Agreement (attach agreement) that expressly provides that it supersedes all provisions of the Program.

OR

Part II: Certification of Compliance

- ❑ My business has and adheres to a written policy that provides, on an annual basis, no less than five days of regular pay for actual jury service for full-time employees of the business who are also California residents, **or** my company will have and adhere to such a policy prior to award of the contract.

I declare under penalty of perjury under the laws of the State of California that the information stated above is true and correct.

Print Name:	**Title:**
Signature:	**Date:**

SECTION 00 04 87

CERTIFICATION OF COMPLIANCE - CONTACT WITH COUNTY PERSONNEL AND COMPLIANCE WITH CODE OF SILENCE PERIOD

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:		E-Mail Address:
Solicitation/Contract for:		

PROPOSER CERTIFICATION

1. The Bidder, _____ (name of the firm), and its subcontractors, have read and understand Article 1.04, paragraph b of the 00 01 00 Instructions to Bidders titled "Contact with County Personnel and Code of Silence Period."

2. Until the underlying contract is executed, all contact and communications related to, about, or regarding this solicitation have been and will be made only in writing (via e-mail) and directed exclusively to the contract analyst identified in the RFP:

   Attention: Ms. Jennell Hluz, Contract Analyst
   E-Mail: jhluz@pw.lacounty.gov
   Telephone: (626) 300-2362

3. Failure to comply with Article 1.04, paragraph b of the 00 01 00 Instructions to Bidders may result in the County, at its sole determination, finding the bid to be non-responsive and disqualified from further consideration.

I declare under penalty of perjury under the laws of the State of California that the information herein is true and correct, and that I am authorized to represent this company.

Print Name:	Title:
Signature:	Date:

To be submitted with each Bid for a contract

Project Identification_____

_____

Bid Date_____

This information must include all construction work undertaken in the State of California by the Bidder and any partnership, joint venture, or corporation that any principal of the Bidder participated in as a principal or owner for the last five calendar years and the current calendar year prior to the date of Bid submittal. Separate information shall be submitted for each particular partnership, joint venture, corporate, or individual Bidder. The Bidder may attach any additional information or explanation of data which he would like taken into consideration in evaluating the safety record. An explanation must be attached of the circumstances surrounding any and all fatalities.

SECTION 00 04 90

CONTRACTOR'S INDUSTRIAL SAFETY RECORD

5-Calendar Years Prior to Current Year

	2021	2022	2023	2024	2025	TOTAL	CURRENT YEAR (2026)
1. No. of Contracts							
2. Total dollar amount of contracts (in thousands of dollars)							
*3. No. of fatalities							
*4. No. of lost workdays due to injuries							
*5. No. of days of restricted work activity due to injuries							
*6. Injuries without lost workdays							

*The information required for these items is the same as required for columns 1, 4, 5, and 6, Log and Summary of Occupational Injuries and Illnesses, CAL/OSHA Form 200.

The above information was compiled from the records that are available to me at this time and I declare under penalty of perjury that the information is true and accurate within the limitations of those records.

_____ Name of Bidder (Print)

_____ Signature

_____ Address

_____ Contractors' State License No. & Classification

_____ City

_____ Telephone

SECTION 00 04 91

INJURY AND ILLNESS PREVENTION PLAN (IIPP) AND CODE OF SAFE PRACTICES (CSP) AFFIDAVIT

The apparent low Bidder shall submit this form to the County which states that the Bidder has an IIPP which complies with Cal/OSHA Regulations and CSP, that all subcontractors supplying employees to the jobsite will be required to prove to the Contractor that they have an IIPP which complies with Cal/OSHA Regulations and a CSP, and that their jobsite employees have been trained on IIPP and CSP.

Failure to submit this affidavit as required may result in a determination that the successful Bidder is nonresponsive and/or nonresponsible.

I, _____, hereby certify to the County

of Los Angeles on behalf of _____ the following:

1. The Contractor identified above has an injury and illness Prevention Plan (IIPP) and a Code of Safe Practices (CSP) which comply with Cal/OSHA Regulations.

2. The employees of the Contractor identified above who will be assigned to the jobsite have been trained on the IIPP and CSP.

3. All subcontractors supplying employees to the jobsite will be required to prove to the Contractor that they have an IIPP and a CSP which comply with Cal/OSHA Regulations and their jobsite employees have been trained on the IIPP and CSP.

I declare under penalty of perjury under the law of the State of California that the foregoing is true and correct.

Executed this_____day of _____
(month and year)

at _____

By_____

SECTION 00 04 92

BIDDER'S ORGANIZATION QUESTIONNAIRE/AFFIDAVIT

Please complete, date and sign this form and place it in your Bid. The person signing the form must be authorized to sign on behalf of the Bidder and to bind the applicant in a Contract.

1. If your firm is a corporation, state its legal name (as found in your Articles of Incorporation) and State of Incorporation:

   _____ _____ _____
   Name State Year Inc.

2. If your firm is a partnership or a sole proprietorship, state the name of the proprietor or managing partner:

   _____

3. If your firm is doing business under one or more DBA's, please list all DBA's and the County(ies) of registration:

Name	County of Registration	Year Became DBA
_____	_____	_____
_____	_____	_____

4. Is your firm wholly or majority owned by, or a subsidiary of, another firm: _____ if yes,

   Name of parent firm: _____

   State of incorporation or registration of parent firm: _____

5. Please list any other names your firm has done business as within the last five (5) years.

Name	Year of Name Change
_____	_____
_____	_____

6. Indicate if your firm is involved in any pending acquisition/merger, including the associated company name. If not applicable, so indicate below.

   _____

   _____

Bidder acknowledges that if any false, misleading, incomplete, or deceptively unresponsive statements in connection with this Bid are made, the Bidder may be rejected. The evaluation and determination in this area shall be at the Director's sole judgment and his/her judgment shall be final:

Bidder's Name

_____

Address:

_____

_____

e-mail address:_____ Telephone number:_____

Fax number: _____

On behalf of _____(Bidder's name), I _____ (Name of Bidder's authorized representative), certify that the information contained in this Bidder's Organization Questionnaire/Affidavit is true and correct to the best of my information and belief.

_____	_____
Signature	Internal Revenue Service Employer Identification Number
_____	_____
Title	California Business License Number
_____	_____
Date	County WebVen Number

SECTION 00 04 93

CERTIFICATION OF COMPLIANCE WITH THE COUNTY'S DEFAULTED PROPERTY TAX REDUCTION PROGRAM

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:	Email address:	
Solicitation/Contract For_____	Services:	

The Proposer/Bidder/Contractor certifies that:

☐ It is familiar with the terms of the County of Los Angeles Defaulted Property Tax Reduction Program, Los Angeles County Code Chapter 2.206; **AND**

To the best of its knowledge, after a reasonable inquiry, the Proposer/Bidder/ Contractor is not in default, as that term is defined in Los Angeles County Code Section 2.206.020.E, on any Los Angeles County property tax obligation; **AND**

The Proposer/Bidder/Contractor agrees to comply with the County's Defaulted Property Tax Reduction Program during the term of any awarded contract.

– OR –

☐ I am exempt from the County of Los Angeles Defaulted Property Tax Reduction Program, pursuant to Los Angeles County Code Section 2.206.060, for the following reasons:

_____

_____

I declare under penalty of perjury under the laws of the State of California that the information stated above is true and correct.

Print Name:	Title:
Signature:	Date:

SECTION 00 04 94

AVOIDANCE OF CONFLICT OF INTEREST

The Los Angeles County Code, Section 2.180.010, provides as follows:

CONTRACTS PROHIBITED

Notwithstanding any other section of this Code, the County shall not contract with, and shall reject any proposals submitted by, the persons or entities specified below, unless the Board of Supervisors finds that special circumstances exist which justify the approval of such contract:

1. Employees of the County or of public agencies for which the Board of Supervisors is the governing body;

2. Profit-making firms or businesses in which employees described in number 1 serve as officers, principals, partners, or major shareholders;

3. Persons who, within the immediately preceding 12 months, came within the provisions of number 1, and who:

    a. Were employed in positions of substantial responsibility in the area of service to be performed by the contract; or

    b. Participated in any way in developing the contract or its service specifications; and

4. Profit-making firms or businesses in which the former employees, described in number 3, serve as officers, principals, partners, or major shareholders.

Contracts submitted to the Board of Supervisors for approval or ratification shall be accompanied by an assurance by the department submitting, district or agency that the provisions of this section have not been violated.

_____

Proposer Name (please print)

_____

Proposer's Official Title (please print)

_____

Proposer's Signature

SECTION 00 04 95

FAMILIARITY WITH THE COUNTY LOBBYIST ORDINANCE CERTIFICATION

The Proposer certifies that it is familiar with the terms of the County of Los Angeles Lobbyist Ordinance, Los Angeles Code Chapter 2.160. The Proposer also certifies that all persons acting on behalf of the Proposer organization have and will comply with it during the proposal process.

Signature:_____

Date:_____

SECTION 00 04 96

PROPOSER'S EEO CERTIFICATION

_____
Company Name

_____
Address

_____
Internal Revenue Service Employer Identification Number

GENERAL

In accordance with provisions of the County Code of the County of Los Angeles, the Proposer certifies and agrees that all persons employed by such firm, its affiliates, subsidiaries, or holding companies are and will be treated equally by the firm without regard to or because of race, religion, ancestry, national origin, or sex and in compliance with all anti-discrimination laws of the United States of America and the State of California.

CERTIFICATION	YES	NO
1. Proposer has written policy statement prohibiting discrimination in all phases of employment.	( )	( )
2. Proposer periodically conducts a self-analysis or utilization analysis of its work force.	( )	( )
3. Proposer has a system for determining if its employment practices are discriminatory against protected groups.	( )	( )
4. When problem areas are identified in employment practices, Proposer has a system for taking reasonable corrective action to include establishment of goal and/or timetables.	( )	( )

_____ _____
Signature Date

_____
Name and Official Title (please print)

00 04 97
COMPLIANCE WITH FAIR CHANCE EMPLOYMENT
HIRING PRACTICES CERTIFICATION

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:	Email address:	
Solicitation/Contract for _____ Services		

PROPOSER/CONTRACTOR CERTIFICATION

The Los Angeles County Board of Supervisors approved a Fair Chance Employment Policy in an effort to remove job barriers for individuals with criminal records. The policy requires businesses that contract with the County to comply with fair chance employment hiring practices set forth in California Government Code Section 12952, Employment Discrimination: Conviction History (California Government Code Section 12952), effective January 1, 2018.

Proposer/Contractor acknowledges and certifies compliance with fair chance employment hiring practices set forth in California Government Code Section 12952 and agrees that Proposer/Contractor and staff performing work under the Contract will be in compliance. Proposer/Contractor further acknowledges that noncompliance with fair chance employment practices set forth in California Government Code Section 12952 may result in rejection of any proposal, or termination of any resultant Contract, at the sole judgment of the County.

I declare under penalty of perjury under the laws of the State of California that the information herein is true and correct and that I am authorized to represent this company.

Print Name:	Title:
Signature:	Date:

00 04 98

ZERO TOLERANCE HUMAN TRAFFICKING POLICY CERTIFICATION

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:	Email address:	
Solicitation/Contract for _____ Services		

PROPOSER CERTIFICATION

Los Angeles County has taken significant steps to protect victims of human trafficking by establishing a zero tolerance human trafficking policy that prohibits contractors found to have engaged in human trafficking from receiving contract awards or performing services under a County contract.

Proposer acknowledges and certifies compliance with (Compliance with County's Zero Tolerance Human Trafficking Policy) of the proposed Contract and agrees that proposer or a member of his staff performing work under the proposed Contract will be in compliance. Proposer further acknowledges that noncompliance with the County's Zero Tolerance Human Trafficking Policy may result in rejection of any proposal, or cancellation of any resultant Contract, at the sole judgment of the County.

I declare under penalty of perjury under the laws of the State of California that the information herein is true and correct and that I am authorized to represent this company.

Print Name:	Title:
Signature:	Date:

00 04 99

DISALLOWED COST ATTESTATION

Company Name:		
Company Address:		
City:	State:	Zip Code:
Telephone Number:	Email address:	
Solicitation/Contract for _____ Services		

PROPOSER ATTESTATION

If Proposer's compliance with a County contract has been reviewed by the Department of the Auditor-Controller within the last 10 years, Proposer must not have unresolved questioned costs identified by the Auditor-Controller, in an amount over $100,000.00, that are confirmed to be disallowed costs by the contracting County department, and remain unpaid for six months or more from the date of disallowance, unless such disallowed costs are the subject of current good faith negotiations to resolve the disallowed costs, in the opinion of the County.

Proposer acknowledges and certifies compliance with the above paragraph.

I declare under penalty of perjury under the laws of the State of California that the information herein is true and correct and that I am authorized to represent this company.

Print Name:	Title:
Signature:	Date:

SAMPLE

SECTION 00 05 00

AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of_____ 202X, by and between the COUNTY OF LOS ANGELES, State of California (hereinafter called the County), and

CONTRACTOR
A California Corporation
ADDRESS
CITY, STATE, ZIP
TELEPHONE

(hereinafter called the Contractor),

WITNESSETH:

1. Contractor's Services

That the Contractor, in consideration of the promises of the County hereinafter set forth, hereby agrees to furnish all tools, equipment, labor, and material necessary to perform and complete in a good and workmanlike manner,

PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
2300 WEST CARSON STREET TORRANCE, CA 90501
SPECS NO. 7669

within the time and in accordance with the recommendation of the Director of the Los Angeles County Public Works, dated month-day, 202X, Plans and Specifications Number, the Notice Inviting Bids, Notice to Bidders A, etc. (if any), and the lump sum bid of the Contractor, including Additive Alternates 1, all of which are incorporated herein as though fully set forth, and are hereby agreed by the parties to constitute the Contract documents.

2. Consideration

That the County agrees, in consideration of the performance of this Contract, to pay to the Contractor, and the Contractor agrees to accept in full satisfaction for the work done hereunder, a sum of amount in words Dollars ($ amount: base bid amount

minus schedule fee minus extended overhead and minus unit, if applicable) which sum shall be paid to the Contractor at the time and in the manner set forth in the specifications.

3. Extended Overhead Daily Rate

The Contractor's Extended Overhead Daily Rate is $XXX, as set forth in the Contractor's Form of Bid, Section 00 03 00, which Extended Overhead Daily Rate shall be payable to the Contractor for each day of Compensable Delay to fully compensate the Contractor for any damages resulting from or associated with Compensable Delay, including, but not limited to, home office and field office overhead, as specified in Specification Section 00 01 00, Instructions to Bidders, 1.14c and in accordance with Specification Section 00 07 00, General Conditions, Article 17, Time Extensions and Compensation for Delay.

4. Notice to Employees Regarding the Federal Earned Income Credit

Contractor shall notify its employees, and shall require each subcontractor to notify its employees, that they may be eligible for the Federal Earned Income Credit under the Federal income tax laws. Such notice shall be provided in accordance with the requirement set forth in Internal Revenue Service Notice 1015.

5. County Rights

The County may employ, either during or after performance of this Contract, any right of recovery the County may have against the Contractor by any means it deems appropriate including, but not limited to, set-off, action at law or in equity, withholding, recoupment, or counterclaim. The rights and remedies of the County under this Contract are in addition to any right or remedy provided by California law.

6. Fair Labor Standards Act

Contractor shall comply with all applicable provisions of the Federal Fair Labor Standards Act, and shall indemnify, defend, and hold harmless County, its agents, officers, and employees from any and all liability including, but not limited to, wages, overtime pay, liquidated damages, penalties, court costs, and attorneys' fees arising under any wage and hour law including, but not limited to, the Federal Fair Labor Standards Act for services performed by Contractor's employees for which County may be found jointly or solely liable.

7. Prevailing Wage Requirements

a. Prevailing Wages

SAMPLE

The services provided in this Contract constitute "public works" as defined in California Labor Code 1720, and are therefore subject to payment of prevailing wages, compliance monitoring and enforcement by the Department of Industrial Relations (DIR).

The Director of the DIR has established the general prevailing rate of per diem wages for each craft, classification, type of worker, or mechanic needed to execute public works and improvements. The current general prevailing wage rate determinations are available at www.dir.ca.gov/dlsr/pwd/index.htm. The Contractor is required to pay its agents and employees the applicable, current prevailing wage rate and is responsible for selecting the classification of workers required to perform this service.

The Contractor agrees to comply with the provisions of Section 1775 of the California Labor Code relating to the payment of prevailing wages, the utilization of apprentices in accordance to LC 1777.5, and the assessment of penalties determined by the California Labor Commissioner. Pursuant to Section 1773.2 of the California Labor Code, copies of the prevailing rate of per diem wages are on file at the Los Angeles County Public Works, Construction Division, and will be made available for inspection by request to the Contract Analyst. Future effective wage rates will be on file with the Department of Industrial Relations. The new wage rates shall become effective on the day following the expiration date of the current determinations and apply to the Contract in the same manner as if they had been included or referenced in the Contract.

b. Work Records

The Contractor shall comply with the requirements of Section 1812 of the Labor Code. The Contractor shall maintain an accurate written record of all employees working on the project each calendar day. The record shall include each employee's name, Social Security number, job classification, and the actual number of hours worked.

c. Posting of Notices

The Contractor shall comply with the provisions of Section 1773.2 of the Labor Code. The Contractor shall post a copy of the prevailing wage rates at the worksite and comply with applicable law including posting of jobsite notices required by 8 California Code Reg. §16451(d):

SAMPLE

"This public works project is subject to monitoring and investigative activities by the Compliance Monitoring Unit (CMU) of the Division of Labor Standards Enforcement, Department of Industrial Relations, State of California. This Notice is intended to provide information to all workers employed in the execution of the Contract for public work and to all contractors and other persons having access to the jobsite to enable the CMU to ensure compliance with and enforcement of prevailing wage laws on public works projects.

The prevailing wage laws require that all workers be paid at least the minimum hourly wage as determined by the Director of Industrial Relations for the specific classification (or type of work) performed by workers on the project. These rates are listed on a separate jobsite posting of minimum prevailing rates required to be maintained by the public entity, which awarded the public works Contract. Complaints concerning nonpayment of the required minimum wage rates to workers on this project may be filed with the CMU at any office of the Division of Labor Standards Enforcement (DLSE).

Local Office Telephone Number:

Division of Labor Standards Enforcement Office
320 West Fourth Street, Suite 450
Los Angeles, CA 90013
(213) 620-6330

Complaints should be filed in writing immediately upon discovery of any violations of the prevailing wage laws due to the short period of time following the completion of the project that the CMU may take legal action against those responsible.

Complaints should contain details about the violations alleged (for example, wrong rate paid, not all hours paid, overtime rate not paid for hours worked in excess of 8 hours per day or 40 hours per week, etc.) as well as the name of the employer, the public entity which awarded the public works Contract, and the location and name of the project.

For general information concerning the prevailing wage laws and how to file a complaint concerning any violation of these prevailing wage laws, you may contact any DLSE office. Complaint forms are also available at the Department of Industrial Relations website found at http://www.dir.ca.gov/Public-Works/PublicWorks.html*."*

d. Certified Payroll Records

The Contractor shall comply with the requirements of Section 1776 of the Labor Code. Contractor and Subcontractors, if any, must furnish certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement) in a format prescribed by the Labor Commissioner.

e. When requested by the County, electronic certified payroll records must be submitted to the County, through an online system designated by the County.

8. Mental Health Services for Critical Incidents

In the event of a serious accident on the Project site, the Los Angeles County Department of Mental Health (DMH) will, if requested, respond. The response may be within a few hours or as long as a few days after the incident, depending on when the request was made. The services DMH will provide include crisis intervention, normalization of the stress response that survivors may be experiencing, stress management techniques and resources if the stress reactions increase in frequency or intensity. Requests for services may be made by calling the DMH Emergency Outreach Bureau Deputy Director, (213) 738-4924, during normal business hours or the ACCESS Center, (800) 854-7771, evenings, holidays, and weekends.

9. Employment Eligibility Verification

Contractor warrants that it fully complies with all Federal statutes and regulations regarding employment of aliens and others, and that all its employees performing services hereunder meet the citizenship or alien status requirements contained in Federal statutes and regulations. Contractor shall obtain, from all covered employees performing services hereunder, all verifications and other documentation of employment eligibility status required by Federal statutes and regulations as they currently exist and as they may be hereafter amended. Contractor shall retain such documentation for all covered employees for the period prescribed by law. Contractor shall indemnify, defend, and hold harmless County, its officers, and employees from employer sanctions and any other liability which may be assessed against Contractor or County in connection with any alleged violation of Federal statutes or regulations pertaining to the eligibility for employment of persons performing services under this Agreement.

10. Contractor Responsibility and Debarment

a. A responsible Contractor is a Contractor who has demonstrated the attribute of trustworthiness, as well as quality, fitness, capacity, and experience to satisfactorily perform the Contract. It is the County's policy to conduct

business only with responsible contractors.

b. The Contractor is hereby notified that, in accordance with Chapter 2.202 of the County Code, if the County acquires information concerning the performance of the Contractor on this or other Contracts which indicates that the Contractor is not responsible, the County may, in addition to other remedies provided in the Contract, debar the Contractor from bidding or proposing on, or being awarded, and/or performing work on County Contracts for a specified period of time, which generally will not exceed five years but may exceed five years or be permanent if warranted by the circumstances, and terminate any or all existing Contracts the Contractor may have with the County.

c. The County may debar a Contractor if the Board of Supervisors finds, in its discretion, that the Contractor has done any of the following: (1) violated a term of a Contract with the County or a nonprofit corporation created by the County; (2) committed an act or omission which negatively reflects on the Contractor's quality, fitness or capacity to perform a Contract with the County, any other public entity, or a nonprofit corporation created by the County, or engaged in a pattern or practice which negatively reflects on same; (3) committed an act or offense which indicates a lack of business integrity or business honesty, or (4) made or submitted a false claim against the County or any other public entity.

d. If there is evidence that the Contractor may be subject to debarment, the Department will notify the Contractor in writing of the evidence which is the basis for the proposed debarment and will advise the Contractor of the scheduled date for a debarment hearing before the Contractor Hearing Board.

e. The Contractor Hearing Board will conduct a hearing where evidence on the proposed debarment is presented. The Contractor and/or the Contractor's representative shall be given an opportunity to submit evidence at that hearing. After the hearing, the Contractor Hearing Board shall prepare a tentative proposed decision, which shall contain a recommendation regarding whether the Contractor should be debarred, and, if so, the appropriate length of time of the debarment. The Contractor and the Department shall be provided an opportunity to object to the tentative proposed decision prior to its presentation to the Board of Supervisors.

f. After consideration of any objections, or if no objections are submitted, a record of the hearing, the proposed decision and any other

recommendation of the Contractor Hearing Board shall be presented to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny or adopt the proposed decision and recommendation of the Hearing Board.

g. If the Contractor has been debarred for a period longer than five years, that Contractor may, after the debarment has been in effect for at least five years, submit a written request for review of the debarment determination to reduce the period of debarment or terminate the debarment. The County may, in its discretion, reduce the period of debarment or terminate the debarment if it finds that the Contractor has adequately demonstrated one or more of the following: (1) elimination of the grounds for which the debarment was imposed; (2) a bona fide change in ownership or management; (3) material evidence discovered after debarment was imposed; or (4) any other reason that is in the best interests of the County.

h. The Contractor Hearing Board will consider a request for review of a debarment determination only where (1) the Contractor has been debarred for a period longer than five years; (2) the debarment has been in effect for at least five years; and (3) the request is in writing, states one or more of the grounds for reduction of the debarment period or termination of the debarment and includes supporting documentation. Upon receiving an appropriate request, the Contractor Hearing Board will provide notice of the hearing on the request. At the hearing, the Contractor Hearing Board shall conduct a hearing where evidence on the proposed reduction of debarment period or termination of debarment is presented. This hearing shall be conducted and the request for review decided by the Contractor Hearing Board pursuant to the same procedures as for a debarment hearing.
The Contractor Hearing Board's proposed decision shall contain a recommendation on the request to reduce the period of debarment or terminate the debarment. <u>The Contractor Hearing Board shall present its proposed decision and recommendation to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny, or adopt the proposed decision and recommendation of the Contractor Hearing Board.</u>

i. These terms shall also apply to subcontractors of County Contractors.

11. <u>Compliance with Jury Service Program</u>

This Contract is subject to provisions of the County's ordinance entitled Contractor Employee Jury Service (Jury Service Program) as codified in Sections 2.203.010 through 2.203.090 of the Los Angeles County Code.

a. Unless Contractor has demonstrated to the County's satisfaction either that Contractor is not a Contractor as defined under the Jury Service Program (Section 2.203.020 of the County Code) or that Contractor qualifies for an exception to the Jury Service Program (Section 2.203.070 of the County Code), Contractor shall have and adhere to a written policy that provides that its employees shall receive from the Contractor, on an annual basis, no less than five days of regular pay for actual jury service. The policy may provide that Employees deposit any fees received for such jury service with the Contractor or that the Contractor deduct from the employee's regular pay the fees received for jury service.

b. For purposes of this Section, Contractor means a person, partnership, corporation or other entity which has a Contract with the County or a subcontract with a County contractor and has received or will receive an aggregate sum of $50,000 or more in any 12-month period under one or more County Contracts or Subcontracts. Employee means any California resident who is a full-time employee of Contractor. Full-time means 40 hours or more worked per week, or a lesser number of hours if: (1) the lesser number is a recognized industry standard as determined by the County, or (2) Contractor has a long-standing practice that defines the lesser number of hours as full-time. Full-time employees providing short-term, temporary services of 90 days or less within a 12-month period are not considered full-time for purposes of the Jury Service Program. If Contractor uses any subcontractor to perform services for the County under the Contract, the subcontractor shall also be subject to the provisions of this Section. The provisions of this Section shall be inserted into any such subcontract Agreement and a copy of the Jury Service Program shall be attached to the Agreement.

c. If Contractor is not required to comply with the Jury Service Program when the Contract commences, Contractor shall have a continuing obligation to review the applicability of its exception status from the Jury Service Program, and Contractor shall immediately notify County if Contractor at any time either comes within the Jury Service Program's definition of Contractor or if Contractor no longer qualifies for an exception to the Program. In either event, Contractor shall immediately implement a written policy consistent with the Jury Service Program. The County may also require, at any time during the Contract and at its sole discretion, that Contractor demonstrate to the County's satisfaction that Contractor either continues to remain outside the Jury Service Program's definition of Contractor and/or that Contractor continues to qualify for an exception to the Program.

d. Contractor's violation of this Section of the Contract may constitute a material

SAMPLE

breach of the Contract. In the event of such material breach, County may, in its sole discretion, terminate the Contractor and/or bar Contractor from the award of future County Contracts for a period of time consistent with the seriousness of the breach.

12. No Payment for Services Provided Following Expiration/Termination of Agreement

Contractor shall have no claim against County for payment for any money or reimbursement, of any kind whatsoever, for any service provided by Contractor after the expiration or other termination of this Agreement. Should Contractor receive any such payment it shall immediately notify County and shall immediately repay all such funds to County. Payment by County for services rendered after expiration/termination of this Agreement shall not constitute a waiver of County's right to recover such payment from Contractor. This provision shall survive the expiration or other termination of this Agreement.

13. Notice to Employees Regarding the Safely Surrendered Baby Law

a. The Contractor shall notify and provide to its employees and shall require each subcontractor to notify and provide to its employees, a fact sheet regarding the Safely Surrendered Baby Law, its implementation in the County of Los Angeles, and where and how to safely surrender a baby. The fact sheet is available on the Internet at www.babysafela.org for printing purposes.

b. The Contractor acknowledges that the County places a high priority on the implementation of the Safely Surrendered Baby Law. The Contractor understands that it is the County's policy to encourage all County Contractors to voluntarily post the County's Safely Surrendered Baby Law in a prominent position at the Contractor's place of business. The Contractor will also encourage its Subcontractors, if any, to post this poster in a prominent position in the Subcontractor's place of business. The County's Department of Children and Family Services will supply the Contractor with the poster to be used.

14. Assignment by Contractor/Mergers or Acquisitions

a. The Contractor shall notify the County of any pending acquisitions/mergers of its company unless otherwise legally prohibited from doing so. If the Contractor is restricted from legally notifying the County of pending acquisitions/mergers, then it should notify the County of the actual acquisitions/mergers as soon as the law allows and provide to the County the legal framework that restricted it from notifying the County prior to the actual acquisitions/mergers.

b. The Contractor shall not assign, exchange, transfer, or delegate its rights or duties under this Contract, whether in whole or in part, without the prior written consent of County, in its discretion, and any attempted assignment, delegation, or otherwise transfer of its rights or duties, without such consent shall be null and void. For purposes of this sub-paragraph, County consent shall require a written amendment to the Contract, which is formally approved and executed by the parties. Any payments by the County to any approved delegate or assignee on any claim under this Contract shall be deductible, at County's sole discretion, against the claims, which the Contractor may have against the County.

c. Any assumption, assignment, delegation, or takeover of any of the Contractor's duties, responsibilities, obligations, or performance of same by any person or entity other than the Contractor, whether through assignment, subcontract, delegation, merger, buyout, or any other mechanism, with or without consideration for any reason whatsoever without County's express prior written approval, shall be a material breach of the Contract which may result in the termination of this Contract. In the event of such termination, County shall be entitled to pursue the same remedies against Contractor as it could pursue in the event of default by Contractor.

15. Contractor's Warranty of Compliance with County's Defaulted Property Tax Reduction Program

Contractor acknowledges that County has established a goal of ensuring that all individuals and businesses that benefit financially from County through contract are current in paying their property tax obligations (secured and unsecured roll) in order to mitigate the economic burden otherwise imposed upon County and its taxpayers.

Unless contractor qualifies for an exemption or exclusion, contractor warrants and certifies that to the best of its knowledge it is now in compliance, and during the term of this contract will maintain compliance, with Los Angeles County Code Chapter. 2.206.

16. Termination for Breach of Warranty to Maintain Compliance with County's Defaulted Property Tax Reduction Program

Failure of contractor to maintain compliance with the requirements set forth in Article 1.34 "Contractor's Warranty of Compliance with County's Defaulted Property Tax Reduction Program" shall constitute default under this contract. Without limiting the rights and remedies available to County under any other provision of this contract, failure of contractor to cure such default within 10 days of notice shall be grounds upon which County may terminate this contract and/or pursue debarment of

contractor, pursuant to County Code Chapter 2.206.

17. Time Off for Voting

The Contractor shall notify its employees and shall require each subcontractor to notify and provide to its employees, information regarding the time off for voting law (Elections Code Section 14000). Not less than 10 days before every statewide election, every Contractor and Subcontractors shall keep posted conspicuously at the place of work, if practicable, or elsewhere where it can be seen as employees come or go to their place of work, a notice setting forth the provisions of Section 14000.

18. Contractor CARD Track/Monitoring Database

The County maintains the Contractor Alert Reporting Database (CARD), which is used to track/monitor poorly performing contractors. When a County department identifies a significant performance/non-compliance issue(s) with a contractor, the department will provide notice to the contractor and will give the contractor an opportunity to correct the issue(s). If the contractor does not take any appropriate steps to correct the issue(s), the County department will enter the contractor, along with any other relevant information pertaining to the contractor's performance issue(s), into CARD.

The information entered into CARD can be accessed by all County departments, and will be used, along with any other relevant information not included in CARD, in determining bidder responsibility. If a department reviews this information and determines that a finding of non-responsibility should be pursued, the department will adhere to the guidelines specified in the Los Angeles County Code Chapter 2.202, and the County's implementation Procedures for Determinations of Contractor Non-Responsibility and Contractor Debarment.

The County maintains databases that track/monitor contractor performance history. Information entered into such databases may be used for a variety of purposes, including determining whether a bidder is responsible for the purposes of a future County contract.

19. Contractor Independence/**Prohibition from Participation in Future Solicitation(s)**

The County Board of Supervisors has adopted a countywide policy that prohibits any person, or any firm [collectively "firm"] or any subsidiary of a firm from submitting a bid or proposal in any County solicitation process

where the person or firm, assisted in the development of the solicitation document(s).

A Proposer, or a Contractor or its subsidiary or Subcontractor ("Proposer/Contractor"), is prohibited from submitting a bid or proposal in a County solicitation if the Proposer/Contractor has provided advice or consultation for the solicitation. A Proposer/Contractor is also prohibited from submitting a bid or proposal in a County solicitation if the Proposer/Contractor has developed or prepared any of the solicitation materials on behalf of the County. A violation of this provision shall result in the disqualification of the Contractor/Proposer from participation in the County solicitation or the termination or cancellation of any resultant County Contract. This provision shall survive the expiration, or other termination of this Agreement.

20. Background and Security Investigations

20.1 Each of Contractor's staff performing services under this Contract, who is in a designated sensitive position, as determined by County in County's sole discretion, shall undergo and pass a background investigation to the satisfaction of County as a condition of beginning and continuing to perform services under this Contract. Such background investigation must be obtained through fingerprints submitted to the California Department of Justice to include State, local, and federal-level review, which may include, but shall not be limited to, criminal conviction information. The fees associated with the background investigation shall be at the expense of the Contractor, regardless of whether the member of Contractor's staff passes or fails the background investigation.

20.2 If a member of Contractor's staff does not pass the background investigation, County may request that the member of Contractor's staff be removed immediately from performing services under the Contract. Contractor shall comply with County's request at any time during the term of the Contract. County will not provide to Contractor or to Contractor's staff any information obtained through the County's background investigation.

20.3 County, in its sole discretion, may immediately deny or terminate facility access to any member of Contractor's staff that does not pass such investigation to the satisfaction of the County or whose background or conduct is incompatible with County facility access.

SAMPLE

20.4 Disqualification of any member of Contractor's staff pursuant to this Paragraph shall not relieve Contractor of its obligation to complete all work in accordance with the terms and conditions of this Contract.

21. Local Small Business Enterprise/Social Enterprise/Disabled Veterans Business Enterprise Utilization

Local Small Business Enterprise means a business that is certified by the County of Los Angeles as a Local Small Business Enterprise (Local SBE), consistent with Chapter 2.204 of the Los Angeles County Code.

21.1 When requested by the County, the contractor shall provide to the County via methods specified by the County, such as submission of electronic live (or dynamic) data on invoices for the prime and all Subcontractors using County-designated third party software system or to a County approved website, or other means of submitting expenditure information on Subcontractors, including but not limited to the following information: the name, business address, California Contractor License number and telephone number/email address of each subcontractor who will perform work or labor for the contractor on the Project in an amount in excess of one-half of 1 percent of the Contractor's total bid. In addition, the Contractor shall be required to provide each of the specified Subcontractors' Local SBE status (i.e., whether any of the listed Subcontractors are Local SBE's), Social Enterprise status, and Disabled Veterans Business Enterprise status and the proposed monetary amount of the work the subcontractor will perform on the Project. In addition, at the time of submittal of the final invoice, the Contractor shall indicate, via methods specified by the County, the actual dollar amounts paid to each listed Subcontractor who performed work on the project.

21.2 Contractor's failure to comply with the provisions of this Article is a material breach of the Agreement. The parties agree that it will be impracticable or extremely difficult to fix the extent of actual damages resulting from the failure to the Contractor to comply with this Article. The parties agree that under the current circumstances a reasonable estimate of such damages is specified in the Schedule for Liquidated Damages for Local Small Business Enterprise Utilization hereunder, and that the Contractor shall be liable to the County for said amounts.

If in the judgment of the Director, or his/her designee, the Contractor is deemed to be in non-compliance with the terms and obligations assumed hereby, the Director or his/her designee, at his/her option, in addition to, or in lieu of, other remedies provided herein in this Agreement, may

deduct and withhold liquidated damages from County's final payment to the Contractor as follows:

SCHEDULE FOR LIQUIDATED DAMAGES FOR LOCAL SMALL BUSINESS ENTERPRISE/SOCIAL ENTERPRISE/DISABLED VETERANS BUSINESS ENTERPRISE UTILIZATION

Final Invoice Price	Liquidated Damages
Up to $100,000	$50.00 plus 0.1% of contract amount
$100,001 to $500,000	$150.00 plus 0.07% of all over 100,000
Over $500,000	$430.00 plus 0.05% of all over $500,000

22. Compliance with County's Zero Tolerance Human Trafficking

Contractor acknowledges that the County has established a Zero Tolerance Human Trafficking Policy prohibiting Contractors from engaging in human trafficking.

If a Contractor or member of Contractor's staff is convicted of a human trafficking offense, the County shall require that the Contractor or member of Contractor's staff be removed immediately from performing services under the Contract. County will not be under any obligation to disclose confidential information regarding the offenses other than those required by law.

Disqualification of any member of Contractor's staff pursuant to this paragraph shall not relieve Contractor of its obligation to complete all work in accordance with the terms and conditions of this Contract.

23. Claims

Notwithstanding Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, Section 9204 of the Public Contract Code shall apply to any claim by the Contractor in connection with the Project.

a. Upon receipt of a claim pursuant to Section 9204 of the Public Contract Code, the County will conduct a reasonable review of the claim and, within a period not to exceed 45 Days, provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, the Contractor and the County may, by mutual agreement, extend the aforementioned time period.

b. The Contractor shall furnish reasonable documentation to support the claim.

c. If Board approval is needed to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the claim, and the Board does not meet within the 45 Days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the County will have up to 3 Days following the next duly publicly noticed meeting of the Board after the 45-Day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.

d. Any payment due on an undisputed portion of the claim will be processed and made within 60 Days after the County issues its written statement. If the County fails to issue a written statement, paragraph (j) shall apply.

e. If the Contractor disputes the County's written response, or if the County fails to respond to a claim issued pursuant to Section 9204 within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the County will schedule a meet and confer conference within 30 Days for settlement of the dispute.

f. Within 10 business days (Monday-Thursday) following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the County will provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim will be processed and made within 60 Days after the County issues its written statement. Any disputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the County and the Contractor sharing the associated costs equally. The County and the Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside those established in Section 9204.

g. Mediation shall include any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or

by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in Section 9204.

h. Unless otherwise agreed to by the County and the Contractor in writing, the mediation conducted pursuant to Section 9204 shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

i. Section 9204 does not preclude the County from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under Section 9204 does not resolve the parties' dispute.

j. Failure by the County to respond to a claim from the Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of Section 9204 shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the County's failure to have responded to a claim, or its failure to otherwise meet the time requirements of Section 9204, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

k. Amounts not paid in a timely manner as required by Section 9204 will bear interest at 7 percent per annum.

l. If a Subcontractor or a lower tier Subcontractor lacks legal standing to assert a claim against the County because privity of the Contract does not exist, the Contractor may present to the County a claim on behalf of a Subcontractor or lower tier Subcontractor. A Subcontractor may request in writing, either on its own behalf or on behalf of a lower tier Subcontractor, that the Contractor present a claim for work which was performed by the Subcontractor or by a lower tier Subcontractor on behalf of the Subcontractor. The Subcontractor requesting that the claim be presented to the County shall furnish reasonable documentation to support the claim. Within 45 Days of receipt of this written request, the Contractor shall notify the Subcontractor in writing as to whether the Contractor presented the claim to the County and, if the original Contractor did not present the claim, provide the Subcontractor with a statement of the reasons for not having done so.

m. A waiver of the rights granted by Section 9204 is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the Contractor and the County may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) the County may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the

provisions of Section 9204, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in Section 9204.

24. Compliance with Fair Chance Employment Practices

Contractor, and its subcontractors, must comply with fair chance employment hiring practices set forth in California Government Code Section 12952. Contractor's violation of this paragraph of the Contract may constitute a material breach of the Contract. In the event of such material breach, County may, in its sole discretion, terminate the Contract.

25. Default Method of Payment: Direct Deposit or Electronic Funds Transfer

25.1 The County, at its sole discretion, has determined that the most efficient and secure default form of payment for goods and/or services provided under an agreement/ contract with the County shall be Electronic Funds Transfer (EFT) or direct deposit, unless an alternative method of payment is deemed appropriate by the Auditor-Controller (A-C).

25.2 The Contractor shall submit a direct deposit authorization request via the website https://directdeposit.lacounty.gov with banking and vendor information, and any other information that the A-C determines is reasonably necessary to process the payment and comply with all accounting, record keeping, and tax reporting requirements.

25.3 Any provision of law, grant, or funding agreement requiring a specific form or method of payment other than EFT or direct deposit shall supersede this requirement with respect to those payments.

25.4 At any time during the duration of the agreement/contract, a Contractor may submit a written request for an exemption to this requirement. Such request must be based on specific legal, business or operational needs and explain why the payment method designated by the A-C is not feasible and an alternative is necessary. The A-C, in consultation with the contracting department(s), shall decide whether to approve exemption requests.

26. Disallowed Cost

If Proposer's compliance with a County contract has been reviewed by the A-C within the last 10 years, Proposer must not have unresolved questioned costs identified by the A-C, in an amount over $100,000.00, that are confirmed to be

disallowed costs by the contracting County department, and remain unpaid for six months or more from the date of disallowance, unless such disallowed costs are the subject of current good faith negotiations to resolve the disallowed costs, in the opinion of the County.

27. Compliance with the County Policy of Equity

The consultant acknowledges that the County takes its commitment to preserving the dignity and professionalism of the workplace very seriously, as set forth in the County Policy of Equity (CPOE) (https://ceop.lacounty.gov/). The contractor further acknowledges that the County strives to provide a workplace free from discrimination, harassment, retaliation and inappropriate conduct based on a protected characteristic, and which may violate the CPOE. The contractor, its employees and subcontractors acknowledge and certify receipt and understanding of the CPOE. Failure of the Contractor, its employees or its Subcontractors to uphold the County's expectations of a workplace free from harassment and discrimination, including inappropriate conduct based on a protected characteristic, may subject the contractor to termination of contractual agreements as well as civil liability.

28. Integrated Pest Management Program Compliance

Contractor acknowledges that County has established an Integrated Pest Management Program (the Program) which aims to reduce or eliminate pollutants moved into surface water through storm water management systems and facilities. Contractor certifies compliance on Integrated Pest Management Program Compliance Certification in Required Forms, that contractor has reviewed, understands, and will adhere to the County's IPM Program requirements as set forth in Integrated Pest Management Program Compliance and at: www.lacountyipm.org

Contractor must ensure and certify that its employees who apply pesticides on County owned or maintained property are appropriately trained. The training, which must be conducted on an annual basis, but no later than June 30th of each calendar year, must meet the County's minimum requirements under the Program.

Employee training may be self-certified by Contractors, provided the County has the ability to audit the training, and must include, at a minimum, the following:

- The potential for pesticide-related surface water toxicity;
- Proper use, handling, and disposal of pesticides;
- Least toxic methods of pest prevention and control, including IPM; and

- Reduction of pesticide use.

All users of commercial pesticides are required by State law to provide a monthly pesticide report to the Los Angeles County Department of Agricultural Commissioner/ Weights and Measures (ACWM). In addition to the mandatory monthly reporting requirement, Contractor shall provide to the Department, with a copy to the ACWM, an annual summary of the pesticides used outdoors on County-owned or maintained property by Fiscal Year (July 1 to June 30). For each pesticide, the summary shall include all of the following:

- Product trade name
- Active ingredient(s)
- EPA Registration Number
- Total amount used

The units reported shall be appropriate to the product (gallons, ounces, pounds, etc.).

29. Termination for Improper Consideration

County may, by written notice to Contractor, immediately terminate the right of Contractor to proceed under this Agreement if it is found that consideration, in any form, was offered or given by Contractor, either directly or through an intermediary, to any County officer, employee, or agent with the intent of securing the Agreement or securing favorable treatment with respect to the award, amendment, or extension of the Agreement or the making of any determinations with respect to Contractor's performance pursuant to the agreement. In the event of such termination, County shall be entitled to pursue the same remedies against Contractor as it could pursue in the event of default by Contractor.

Contractor shall immediately report any attempt by a County officer or employee to solicit such improper consideration. The report shall be made either to County manager charged with the supervision of the employee or to County A-C's Employee Fraud Hotline at (213) 974-0914 or (800) 544-6861.

Among other items, such improper consideration may take the form of cash, discounts, service, the provision of travel or entertainment, or tangible gifts.

30. Gratuities

Contractor is advised that it is improper for any County officer, employee, or agent to solicit consideration, in any form, from Contractor with the implication, suggestion, or

statement that Contractor's provision of the consideration, or failure to provide consideration, may cause favorable or unfavorable treatment, respectively, for the Contractor relating to the amendment or extension of the Contract or the making of any determinations with respect to Contractor's performance under this Contract. A Contractor shall not offer or give, either directly or through an intermediary, such improper consideration, in any form, to a County officer, employee, or agent for the purpose of securing favorable treatment as described herein.

A Contractor shall immediately report any attempt by a County officer, employee, or agent to solicit such improper consideration. The report shall be made either to the County manager charged with the supervision of the employee or to the County Auditor-Controller's Employee Fraud Hotline at (800) 544-6861.

Among other items, such improper consideration may take the form of cash; discounts; services; and the provision of travel, entertainment, or tangible gifts.

Note that Contractor's failure to adhere to this requirement could subject this Contract to Termination for Improper Consideration paragraph in this Agreement.

31. Facsimile/Electronic Representations

The County and the Contractor hereby agree to regard facsimile/electronic representations of original signatures of authorized officers of each party, when appearing in appropriate places on the Agreement, Change Orders and amendments prepared, and received via communications facilities, as legally sufficient evidence that such original signatures have been affixed to amendments to this Contract, such that the parties need not follow up facsimile/electronic transmissions of such documents with subsequent (non-facsimile/electronic) transmission of “original” versions of such documents. Electronic signatures include facsimile or e-mail electronic signatures. Each executed counterpart shall be deemed an original. All counterparts, taken together, constitute the executed Agreement. The parties hereby acknowledge and agree that electronic records and electronic signatures, as well as facsimile signatures, used in connection with the execution of this Agreement and electronic signatures, facsimile signatures or signatures transmitted by electronic mail in so-called pdf format shall be legal and binding and shall have the same full force and effect as if a paper original of this Agreement had been delivered had been signed using a handwritten signature. Contractor and County (i) agree that an electronic signature, whether digital or encrypted, of a party to this Agreement is intended to authenticate this writing and to have the same force and effect as a manual signature, (ii) intend to be bound by the signatures (whether original, faxed or electronic) on any document sent or delivered by facsimile or, electronic mail, or other electronic means, (iii) are aware that the other party will rely on such signatures, and (iv) hereby waive any defenses to the

enforcement of the terms of this Agreement based on the foregoing forms of signature. If this Agreement has been executed by electronic signature, all parties executing this document are expressly consenting under the United States Federal Electronic Signatures in Global and National Commerce Act of 2000 ("E-SIGN") and California Uniform Electronic Transactions Act ("UETA")(Cal. Civ. Code § 1633.1, et seq.), that a signature by fax, e-mail or other electronic means shall constitute an Electronic Signature to an Electronic Record under both E-SIGN and UETA with respect to this specific transaction.

32. Advertising and Other External Communications About the Project

Consultant/Contractor shall obtain the County's prior written approval before disclosing or communicating any information concerning the award of the contract, the progress of the work, or the completion of the work, to any non-party, including but not limited to outside media and news organizations. This requirement includes, but is not limited to: (1) a Consultant/Contractor's, application for an award or any other recognition of the project; and (2) any advertising or promotion of the project and/or the Consultant/Contractor's role on the project. The County retains the sole discretion as to the release of such information, including the right to deny the request for disclosure, the right to direct the timing of the disclosure, and/or the right to direct Consultant/Contractor to make revisions to the information prior to disclosure.

33. COVID-19 Requirement for County Contractor Personnel

When applicable and required by the County, the Contractor shall comply with all other applicable local, departmental, State, and federal laws, regulations, and requirements for COVID-19.

34. Countywide Community Workforce Agreement

On June 7, 2023, the County executed the Countywide Community Workforce Agreement (CWA) with the Los Angeles/Orange Counties Building and Construction Trades Council and its respective unions, attached as Exhibit XXX of this agreement. Pursuant to the Board's direction and executed Countywide CWA, Countywide CWA will apply to this Project. The Contractor shall comply with all terms therein and shall be bound by the terms and conditions of the Countywide CWA applicable to the contractors for all Work on the Project for the entire duration of the Project. Countywide CWA shall be deemed incorporated in full into this agreement including, but not limited to, the provisions regarding the hiring of workers for the Project by the Contractor and all of its subcontractors of all tiers. Contractor shall execute and return to the County the Letter of Assent, attached to the Countywide CWA as Attachment A, at the time of contract execution and shall cause each of its subcontractors of all tiers

to also execute and return to the County a copy of the Letter of Assent.

35. **Campaign Contribution Prohibition Following Final Decision in Contract Proceeding**

Pursuant to Government Code Section 84308, Contractor and its Subcontractors, are prohibited from making a contribution of more than $500 to a County officer for twelve (12) months after the date of the final decision in the proceeding involving this Contract. Failure to comply with the provisions of Government Code Section 84308 and of this paragraph, may be a material breach of this Contract as determined in the sole discretion of the County.

36. Federally Funded Work

This provision will apply when federally funded or potentially federally funded work is needed by County. In accordance with Federal Executive Order 12549 and 12689 (Debarment and Suspension), individuals or entities that have been debarred by the Federal government may not receive work under this Contract as a Contractor or Subcontractor. Contractors and/or Subcontractors listed on the governmental exclusions in the System for Award Management (SAM) are not eligible to receive federally funded work under this contract. See Office of Management and Budget guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension". The SAM exclusions contains the names of parties debarred, suspended, or otherwise excluded by Federal agencies as well as parties declared ineligible under statutory or regulatory authority.

For federally funded work, the Project Manager will, before assigning work or Notice to Proceed to the Contractor, verify that the Contractor is not listed on the governmental exclusions in the SAM as a party excluded or ineligible by Federal agencies to participate in federally funded projects. For your reference, a List of Debarred Contractors by U.S. Department of Labor's (DOL) Office of Federal Contract Compliance Programs (OFCCP) may be obtained by going to the following website: https://sam.gov/content/home.

If the Contractor is listed on the governmental exclusions in the SAM as a party excluded or ineligible by Federal agencies to participate in federally funded projects, then said Contractor will not be offered the work. The Project Manager will notify the Contractor of their negative standing in the SAM. The Project Manager will also notify the Contractor of their ineligibility to receive any federally funded work under

this contract, until the Contractor is able to satisfactorily correct the issue. The Contractor shall notify the Project Manager when the Contractor has corrected their negative standing in the SAM, and the Contractor is no longer listed on the governmental exclusions in the SAM.

If the Contractor is not listed on the governmental exclusions in the SAM as a party excluded or ineligible by Federal agencies to participate in federally funded projects, Public Works may offer said Contractor the federally funded work. In addition, if applicable, the Contractor is required to verify that its subcontractors/subconsultants are not listed on the governmental exclusions in the SAM, before assigning federally funded work to its subcontractors/subconsultants.

SAMPLE

IN WITNESS WHEREOF, the County has, by order of its Board of Supervisors, caused these presents to be subscribed by the Director of Public Works, and the Contractor has hereunto subscribed its corporate name and affixed its corporate seal by its duly authorized officers the day, month, and year herein first above written.

COUNTY OF LOS ANGELES

By_____
Director of Public Works

NAME OF CONTRACTOR

By_____
President

_____
Type/Print Name

By_____
Secretary

_____
Type/Print Name

_____ _____
CLASSIFICATION LICENSE NO.
Contractor

APPROVED AS TO FORM:

DAWYN R. HARRISON
County Counsel

By_____
Deputy

_____
Type/Print Name

SAMPLE

SAMPLE

BOND FOR FAITHFUL PERFORMANCE

KNOW ALL PERSONS BY THESE PRESENTS:

That we, Contractor, a California Corporation, as principal, and

_____

_____

(name and address)

as surety, are held and firmly bound unto the County of Los Angeles, State of California, in the sum of AMOUNT IN WORDS DOLLARS ($ amount), lawful money of the United States, for the payment of which sum, well and truly to be made, we bind ourselves, jointly and severally, firmly by these presents.

The condition of the foregoing obligation is such that whereas said principal has been awarded and is about to enter into the annexed Contract with the County of Los Angeles, State of California, for

PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
2300 WEST CARSON STREET TORRANCE, CA 90501
SPECS NO. 7669

and is required by said County to give this bond in connection with the execution of said Contract.

NOW, THEREFORE, if the said principal shall well and truly do and perform all of the covenants and obligations of said Contract on its part to be done and performed at the times and in the manner specified therein, then this obligation shall be null and void, otherwise it shall be and remain in full force and effect. No premature payment by said County to said principal shall exonerate any surety unless the Board of Supervisors of said County shall have actual notice that such payment is premature at the time it is ordered by said Board, and then only to the extent that such payment shall result in loss to such surety, but in no event more than the amount of such premature payment. The surety hereby waives notice of any change, including changes of time, to said Contract or related subcontractors, purchase orders and other obligations.

SAMPLE

WITNESS our hands this _____ day of _____, 2XXX.

NAME OF Contractor

_____
President

_____
Type/Print Name

_____
Secretary

_____
Type/Print Name

APPROVED AS TO FORM:

DAWYN R. HARRISON
County Counsel

By_____
Deputy

_____
Type/Print Name

_____
Surety

_____
Attorney-in-Fact

_____
Type/Print Name

SAMPLE

SAMPLE

PAYMENT BOND FOR LABOR AND MATERIALS

KNOW ALL PERSONS BY THESE PRESENTS:

That we, Contractor, a California corporation, as principal, and

_____

_____

(name and address)

as surety, are held firmly bound unto the County of Los Angeles, State of California, hereinafter referred to as the County, in the sum of AMOUNT IN WORDS DOLLARS ($XXXXXXX) lawful money of the United States, for the payment of which sum, well and truly made, we bind ourselves, jointly and severally, firmly by these presents.

The condition of the above obligation is such that, whereas said principal has been awarded and is about to enter into a written Contract with the County for:

> PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
> 2300 WEST CARSON STREET TORRANCE, CA 90501
> SPECS NO. 7669

which is hereto attached, made a part hereof, and to which reference is hereby made for all, and is required by said County to give this bond in connection with the execution of said Contract.

NOW, THEREFORE, if said principal, as contractor in said Contract, or principal's Subcontractor, fails to pay any of the persons referred to in Section 9100 of the Civil Code of the State of California for labor performed, skills, or other necessary services bestowed, site improvement made, equipment leased, or appliances, equipment, implements, machinery, materials, power, provender, provisions, teams, or trucks furnished or used in, upon, or about the performance of this work contracted to be done, or for amounts due under the Unemployment Insurance Code with respect to work or labor performed by such claimant, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Contractor and Subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with Respect to such work and labor, said surety shall pay for the same in an amount not exceeding the sum specified above, and if suit is brought upon this bond, a reasonable attorney's fee to be fixed by the court. This bond is executed pursuant to Chapter 7 of Division 3, Part 4, Title 15 of the Civil Code of the State of California, and shall inure to the benefit of any of the persons referred to in said Civil Code Section 9100, as it now exists or

SAMPLE

may hereafter be amended, so as to give a right of action to such persons or their assigns in any suit brought upon this bond. No premature payment by said County to said principal shall exonerate any surety unless the Board of Supervisors of said County shall have actual notice that such payment is premature at the time and it is ordered by said Board, and then only to the extent that such payment shall result in loss to such surety, but in no event more than the amount of such premature payment.

It is agreed that any alterations in the work to be done or increase or decrease of the materials to be furnished, which may be made pursuant to the terms of said Contract shall not in any way release either the principal or surety hereunder, nor shall any extensions of time granted under the provisions of said Contract release either the principal or surety, and notice of such alterations or extensions of this Contract is hereby waived by the surety.

WITNESS our hands this _____ day of _____, 2XXX

NAME OF Contractor

_____
President

_____
Type/Print Name

_____
Secretary

_____
Type/Print Name

APPROVED AS TO FORM:

DAWYN R. HARRISON
County Counsel

_____
Surety

By_____
Deputy

_____
Attorney-in-Fact

_____
Type/Print Name

_____
Type/Print Name

SAMPLE

CERTIFICATION

SUBJECT: PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
2300 WEST CARSON STREET TORRANCE, CA 90501
SPECS NO. 7669

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I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for Worker's Compensation or to undertake self-insurance in accordance with the provisions of that Code, and I will comply with such provisions before commencing the performance of the work of this Contract.

NAME OF Contractor

_____
Contractor's Signature

_____
Print Name

_____
Date

SAMPLE

SAMPLE

STATEMENT OF UNDERSTANDING

SUBJECT: PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
2300 WEST CARSON STREET TORRANCE, CA 90501
SPECS NO. 7669

As the Contractor of the project, I have reviewed the Best Management Practices Handbooks, California Storm Water Quality Association, Menlo Park, CA and have proposed the implementation of the Best Management Practices (BMPs) applicable to effectively minimize the negative impacts of this Project's construction activities on the surrounding water quality. The selected BMPs will be installed, monitored, and maintained to ensure their effectiveness. The BMPs that I have not chosen for implementation are redundant or deemed not applicable to the proposed construction activities. If at any time, site conditions and/or the County official warrant re-evaluation and revisions of the chosen BMPs, the appropriate changes will be made without unnecessary delay. I am aware that failure to properly implement and maintain the BMPs necessary to prevent the discharge of pollutants from this project could result in significant penalties and/or delays.

NAME OF Contractor

_____
Signature

_____
Print Name

_____
Date

SAMPLE

SECTION 00 06 10
BOND FOR FAITHFUL PERFORMANCE

KNOW ALL PERSONS BY THESE PRESENTS:

That we, CONTRACTOR, a California Corporation, as principal, and _____, as surety, are held and firmly bound unto the COUNTY OF LOS ANGELES, State of California, in the sum of XXX DOLLARS ($), lawful money of the United States, for the payment of which sum, well and truly to be made, we bind ourselves, jointly and severally, firmly by these presents.

The condition of the foregoing obligation is such that whereas said principal has been awarded and is about to enter into the annexed contract with the County of Los Angeles, State of California, for

PROJECT
PLACE
SPECS. NO.

and is required by said County to give this bond in connection with the execution of said contract;

NOW, THEREFORE, if the said principal shall well and truly do and perform all of the covenants and obligations of said contract on its part to be done and performed at the times and in the manner specified therein, then this obligation shall be null and void, otherwise it shall be and remain in full force and effect. No premature payment by said County to said principal shall exonerate any surety unless the Board of Supervisors of said County shall have actual notice that such payment is premature at the time it is ordered by said Board, and then only to the extent that such payment shall result in loss to such surety, but in no event more than the amount of such premature payment. The surety hereby waives notice of any change, including changes of time, to said contract or related subcontracts, purchase orders and other obligations. The surety hereby waives notice of any change, including changes of time, to said contract or related subcontractors, purchase orders and other obligations.

WITNESS our hands this _____ day of _____, 20

CONTRACTOR

_____
President

_____
Secretary

_____
Surety

_____
Attorney-in-Fact

APPROVED AS TO FORM:

DAWYN R. HARRISON
County Counsel

By_____
Senior Deputy County Counsel

SAMPLE

SECTION 00 06 20
PAYMENT BOND FOR LABOR AND MATERIALS

KNOW ALL PERSONS BY THESE PRESENTS:

That we, CONTRACTOR, a California corporation, as principal, and _____ as surety, are held firmly bound unto the COUNTY OF LOS ANGELES, State of California, hereinafter referred to as the County, in the sum of DOLLARS ($) lawful money of the United States, for the payment of which sum, well and truly made, we bind ourselves, jointly and severally, firmly by these presents.

The condition of the above obligation is such that, whereas said principal has been awarded and is about to enter into a written contract with the County for:

NAME OF PROJECT
PLACE
SPECS. NO.

which is hereto attached, made a part hereof, and to which reference is hereby made for all particulars, and is required by said County to give this bond in connection with the execution of said contract.

NOW, THEREFORE, if said principal, as contractor in said contract, or principal's subcontractor, fails to pay any of the persons referred to in Section 9100 of the Civil Code of the State of California for labor performed, skills or other necessary services bestowed, site improvement made, equipment leased, or appliances, equipment, implements, machinery, materials, power, provender, provisions, teams, or trucks furnished or used in, upon, or about the performance of this work contracted to be done, or for amounts due under the Unemployment Insurance Code with respect to work or labor performed by such claimant, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, said surety shall pay for the same in an amount not exceeding the sum specified above, and if suit is brought upon this bond, a reasonable attorney's fee to be fixed by the court. This bond is executed pursuant to Chapter 7 of Division 3, Part 4, Title 15 of the Civil Code of the State of California, and shall inure to the benefit of any of the persons referred to in said Civil Code Section 9100, as it now exists or may hereafter be amended, so as to give a right of action to such persons or their assigns in any suit brought upon this bond. No premature payment by said County to said principal shall exonerate any surety unless the Board of Supervisors of said County shall have actual notice that such payment is premature at the time and it is ordered by said Board, and then only to the extent that such payment shall result in loss to such surety, but in no event more than the amount of such premature payment.

It is agreed, that any alterations in the work to be done, or increase or decrease of the materials to be furnished, which may be made pursuant to the terms of said contract shall not in any way release either the principal or surety hereunder, nor shall any extensions of time granted under the provisions of said contract release either the principal or surety, and notice of such alterations or extensions of this contract is hereby waived by the surety.

WITNESS our hands this _____ day of _____, 20

CONTRACTOR

_____
President

APPROVED AS TO FORM:

_____
Secretary

DAWYN R. HARRISON
County Counsel

_____
Surety

By_____
Senior Deputy County Counsel

_____
Attorney-in-Fact

Sample

SECTION 00 07 00

GENERAL CONDITIONS

A. Bid Form, Equals, Use of Drawings & Manual

1. Bid Forms
2. Equals
3. Additional Sets of Drawings and Project Manual

B. Drawings & Specifications

4. Drawings and Specifications
5. Contract Documents and Order of Precedence
6. Interpretation of Drawings and Specifications
7. Project Manual
8. Standard Specifications
9. Substitutions Required Because of Federal Government Restrictions or Lack of Product Availability
10. As-Built Drawings
11. Reference Materials

C. Schedule, Changes in Work

12. Construction Schedule
13. County's Right to Delay Commencement of the Work
14. Updated Schedules
15. Changes in the Work
16. Provisions for Extras
17. Time Extensions and Compensation for Delay

D. Inspection/Permits, Tests, Quality, Warranties

18. Observation
19. Permits, Licenses, and Inspections
20. Tests

E. Substantial Completion, Occupancy by County

21. Substantial Completion
22. Occupancy by County

F. Employment Requirements

23. Workers
24. Hours of Work
25. Saturday, Sunday, Holidays, and Overtime Work
26. Prevailing Wage Scale
27. Employment of Indentured Apprentices
28. Affirmative Action Plan for Equal Employment Opportunity

G. Contractor Responsibilities, Restrictions

29. Payroll Records
30. Quality of Work and Material
31. Responsibility of Contractor and of Contractor's Representative on the Work
32. Repairing Damaged Work
33. List of Subcontractors and Subletting Work
34. Advertising
35. Certificate as to Compliance with Certain Regulations
36. Coordination with Others and Other Contracts
37. Contractor's Construction Equipment
38. Contractor Personnel
39. Audits and Records
40. Warranty and Corrections to Work
41. Hazardous Material
42. Contractor Safety Requirements

H. Indemnification and Insurance

43. Indemnification
44. General Insurance Requirements
45. Insurance Coverage Requirements--Types and Limits
46. Not used.
47. Not used.

I. Legal/Other

48. Assignment
49. Patents
50. Suspension and/or Termination of Work and/or Contract
51. Contractor's Warranty of Adherence to County's Child Support Compliance Program
52. Contractor's Acknowledgment of County's Commitment to Child Support Enforcement
53. Limitation of Liability
54. Forum Selection
55. Waiver
56. Prior Agreements
57. Progress Payments
58. Acceptance of Final Payment as Release
59. Substitution of Securities for Retention
60. Resolution of Construction Claims
61. Conflict of Interest
62. Anti-Trust Claims
63. County's Quality Assurance Plan
64. Laws, Codes and Regulations to Be Observed

SECTION 00 07 00

GENERAL CONDITIONS

1. BID FORMS:

One copy of the Bid Forms accompany this Project Manual for Bidder's use.

Should these specifications be issued without the Bid Forms, or should the copy be lost or damaged, the Bidder must notify the Department of Public Works, in order that he/she may receive the forms or he/she may copy the forms bound into the Project Manual. All bids must be submitted on these forms or a facsimile thereof.

The Bidder shall not attach his bid to the returned Project Manual, nor use the Bid Forms, which are bound therein.

2. EQUALS:

A. Except as may be provided in the Proprietary Specification Section of these General Conditions, whenever any material, product, thing or service is specified or indicated in the Bid Documents by brand, trade, patent or proprietary name and/or by the name of the manufacturer, the item so specified or indicated shall be deemed to be followed by the words "or equal."

B. While preparing the bid, the Bidder may, at its own risk, submit an item not specified in the Bid Documents as an "or equal" for consideration by the County. Failure to do so within the time frame described in Subparagraph D below shall bar the Bidder from proposing or substituting an "or equal" item for an item specified in the Bid Documents.

C. If the Bidder includes an "or equal" item with the bid, the Bidder must submit sufficient data to the County to substantiate the specific characteristics and qualities which make the "or equal" item the equivalent in all respects of the item specified in the Bid Documents as described in Subparagraph D below. The Bidder shall furnish such substantiating data or arrange for any necessary tests to verify the equivalent qualities of the "or equal" item at the Bidder's sole expense.

D. The first, second and third apparent low bidder will have two (2) calendar days after the bid opening to submit their list of Equals (Section 00 04 40)

and ten (10) calendar days after the bid opening to submit all substantiating data and test results. No list of Equals will be accepted after the close of business two (2) calendar days after bids are opened. Likewise, no substantiating data and test results will be accepted after the close of business ten (10) calendar days after bids are opened.

E. The County, in its sole discretion, shall determine whether the substantiating data demonstrates that an "or equal" item is equal in all respects to the item specified in the Bid Documents. If the County determines that the "or equal" item has not been substantiated to be equal in all respects, the item specified in the Bid Documents shall be furnished and/or installed by Contractor without modification of the bid amount or Contract Documents.

F. The Contract Time for completion of the Work specified in the Contract Documents shall not be affected by any circumstances whatsoever arising from the provisions of this article.

G. The Contract Documents, Drawings, and Specifications have been prepared to complement and accommodate certain specified equipment, products, or systems and any modifications, adjustment, or redesign required to assimilate any County approved substitution or "or equal" equipment, products, or systems shall be at the Contractor's expense. Contractor shall provide a complete and workable application and shall satisfy design criteria and aesthetic values to the sole satisfaction of the County.

3. ADDITIONAL SETS OF DRAWINGS AND PROJECT MANUAL:

Upon award of contract, the Contractor will be furnished with eight (8) full-size sets of Drawings. Up to twenty additional sets may be furnished upon request. Project Manuals will be issued with each set of Drawings for construction use.

4. DRAWINGS AND SPECIFICATIONS:

Specifications are intended to establish the standards for quality, performance, and technical requirements for all labor, workmanship, material, methods, and equipment necessary to complete the Work shown or reasonably implied on the Drawings and Specifications. The Drawings are intended to establish the scope, arrangement, graphic detail, and to illustrate the contract requirements. The Drawings and Specifications are intended to compliment and supplement one another, and any part of the Work that may be mentioned or indicated in the one and not represented in the other shall be done the same as if it had been mentioned or represented in both. Work, materials, or equipment of a minor nature which may

not be specifically mentioned in the specifications or indicated on the Drawings, but which may be reasonably assumed as necessary for the completeness of the Work, shall be performed and or supplied by the Contractor the same as if it were shown on the Drawings or described in the Specifications. In case of discrepancy either in the figures, on the drawings, or in the specifications, the matter shall be promptly submitted to the Director, or the Director's representative, who shall promptly make a determination in writing.

5. CONTRACT DOCUMENTS AND ORDER OF PRECEDENCE:

A. In the event that any provision(s) in any component part of the Contract Documents conflicts with any provision(s) of any other component part, the following order of precedence among the Contract Documents' component parts shall govern:

1. Written Amendments and Change Orders to the Contract in reverse chronological order
2. Addenda and Notices to Bidders in reverse chronological order
3. County-Contractor Agreement
4. Project Manual and Drawings
5. Performance Bond
6. Labor and Material Payment Bond

B. In the event there is a conflict between or among any provisions within one of the component parts of the Contract Documents, the higher standard or the more stringent requirement shall govern.

6. INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

A. The Director, or his/her authorized representative, will interpret the meaning of any part of the Drawings and Specifications about which any misunderstanding may arise. Should there appear to be any inconsistency or discrepancy in or between the Drawings and Specifications, the Contractor shall refer the matter to the Director, and then proceed without delay to complete the Work under question after the matter has been resolved by the Director. Should the Contractor proceed with the Work without referring the matter to, or obtaining resolution from the Director, Contractor does so on Contractor's own responsibility and without recourse to the County or County's employees, agents, etc.

B. If the Contractor disagrees with the interpretation of the Director, or his/her authorized representative, they shall promptly, and within ten (10) days after

receipt of the interpretation, file a written request for a hearing before the Disputes Review Board as provided herein. Such written request shall outline in detail areas and scope of the Contractor's disagreement with the interpretation. The Contractor shall continue with the Work in accordance with the Director's interpretation, maintaining accurate and complete records of all cost and time impacts related to the Work involved in the disputed interpretation. These records shall be filed with the Director in a timely manner as the Work progresses.

C. The Disputes Review Board selected by the Director is composed of three County personnel having a grade of Section Head or higher. The Board will convene to hear all matters related to the dispute within forty-five (45) calendar days after receipt of an acceptable request to convene. An acceptable "request for hearing" is defined as a request that outlines in detail the following:

1. Areas and scope of disagreement with the interpretation.

2. All areas of inconsistency/discrepancy in the drawings and/or specifications related to the dispute. Cite the specific drawings, details, specification sections, and paragraphs.

The Director shall determine whether a hearing will be conducted and may reject the request for hearing on the basis of information presented in the request.

D. The hearing will be informal and formal rules of evidence will not apply. The Board will submit its recommendation within a reasonable period of time following conclusion of the hearing. The Director will promptly render an interpretation notice to the Contractor.

7. PROJECT MANUAL:

A. The Project Manual is divided for convenience into divisions and sections as set forth in the Table of Contents preceding these General Conditions. Format is based upon the CSI Master Format for Construction Specifications. Schedules of Work included in these sections are given for convenience and shall not be considered as a comprehensive list of items necessary to complete the Work of any section.

B. Where devices or items, or parts thereof are referred to in the singular, it is intended that such reference shall apply to as many such devices, items, or parts as are required to properly complete the Work.

8. STANDARD SPECIFICATIONS:

A. Where these Specifications or the Building Code stipulate that a material shall conform to the American Society for Testing Materials (ASTM) specifications or other recognized standards, the Contractor shall, when so required, deliver to the Department an affidavit or certificate in triplicate, signed by the manufacturer or supplier that the material furnished conforms to specifications or standards mentioned. When tests are required, the results of such tests shall be delivered to the Department.

B. References to the "Building Code" are to the edition of the applicable Building Code listed on the drawings, including any amendments thereto.

9. SUBSTITUTIONS REQUIRED BECAUSE OF FEDERAL GOVERNMENT RESTRICTIONS OR LACK OF PRODUCT AVAILABILITY:

A. In the event that certain materials or equipment specified are entirely unobtainable or not obtainable in sufficient quantities or within a reasonable time, due to Federal Government restrictions or other causes growing out of the national defense or war programs, the awarding entity may permit the use of equal and equivalent materials of other type of manufacture in their place. Before such substitutions can be made, the Contractor shall submit a written statement to the awarding entity setting forth in full the reasons why the materials specified are unobtainable and describing in full the materials which he proposed to supply in their place. Substitutions shall not be made until the approval of the awarding entity, in writing, has first been obtained.

B. Should a specified item not be obtainable due to product unavailability, the awarding entity may permit the use of equal and equivalent materials of other type of manufacture in their place. Contractor shall follow the procedure identified in Paragraph A above in order to obtain approval.

10. AS-BUILT DRAWINGS:

A. The Contractor shall keep one (1) complete and up-to-date set of prints at all times on the job, reserved for use as a record set of changes from the bid set. Throughout the duration of the construction work, this set of prints shall be the responsibility of the Contractor to maintain as a record of all field changes including underground runs, which are installed in locations other than those indicated on the Contract Drawings and those that have been indicated as to be field run as located. The lines shall be located on the Drawing dimensionally from a fixed point, such as a street-curb line, or centerline, or a permanent structure. A copy of the updated as-built prints and as-built specifications shall be made available to the County Project Manager with the monthly progress payment requests.

B. Contractor progress payment will be contingent upon the as-built drawings and specifications being maintained in current status, and the County Inspector will not approve progress payments unless these as-built drawings and specifications are current.

C. As a condition to certifying the final payment under this Contract, within 30 calendar days after substantial completion, the Contractor will submit to the Project Manager the original set of as-built prints as well as the set of as-built specifications. If needed, a complete set of blue line prints of the Drawings will be furnished to the Contractor for which the as-built drawings are required. All variations from the Contract Drawings and any additional information required by the Specifications shall be entered on the as-built drawings and specifications as they occur, neatly and legibly, in ink of a contrasting color or otherwise marked as approved by the County. Each set of as-built drawings and specification shall be signed and dated before being accepted by the County representative at the completion of the Work.

11. REFERENCE MATERIALS:

The Contractor shall furnish and maintain on-site reference material including at least one copy of all applicable codes referenced in the Contract Documents as necessary for the performance of the Work specified.

12. CONSTRUCTION SCHEDULE:

A. All time limits stated in the Contract Documents are of the essence of the Contract. The Contractor shall prosecute the Work at such time and in such manner that Substantial Completion of the Work shall occur in accordance

with the Contract and the Contract Time, including authorized adjustments thereto.

B. The Contractor shall provide a Contract Schedule for the Work in accordance with the requirements of Section 01 32 00, Construction Schedule.

C. The term "day" when used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

13. COUNTY'S RIGHT TO DELAY COMMENCEMENT OF THE WORK:

The Department, on behalf of the County, shall have the right to direct that the Contractor shall withhold actual commencement of the Work of construction until sufficient material, in the opinion of the Department, has been delivered to the site of the Work to insure completion of the Work without interruption, and the Contractor shall comply with such instructions when issued. The Contractor shall be granted an extension of the completion time of the contract equal to the number of working days delay caused to Contractor pursuant to Contractor's compliance with such instructions.

14. UPDATED SCHEDULES:

Updated schedules shall be attached with the Contractor's request for payment and shall be a condition required prior to payment. Each schedule shall include a narrative report defining problem areas, anticipated delays, and their impact on the schedule, and the corrective action that shall be taken by the Contractor and its affect.

15. CHANGES IN THE WORK:

A. Written Changes

1. The County may, at any time, without notice to the Surety, make changes in the Work within the general scope of the Contract, including changes:

a. in the Specifications and the Drawings;

b. in the method or manner of performance of the Work;

c. in the facilities, equipment, materials, services, or site to be furnished by the County;

d. directing acceleration in the performance of the Work; or

e. directing the Contractor to suspend, delay, or interrupt all or any part of the Work for such period of time as the County may determine to be appropriate for the convenience of the County.

2. Such changes shall be made in accordance with either of the following methods:

a. By a written Supplemental Agreement ordered by the County (or awarding authority if other than the County) in the manner specified by Public Contract Code Sections 20136, 20137, 20138, or 20145, or other successor statues.

b. By written Change Order, signed by the Director, in the manner and amounts specified by Public Contract Code Section 20142 or its successor statutes.

3. If any change or proposed change under this paragraph causes or would cause an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the Work, whether changed or not changed by any such order, the Contractor may request an equitable adjustment under the terms of this paragraph and under "Construction Schedule," Section 01 32 00. At County's option, the County may negotiate an equitable adjustment for the price and time impact for the proposed changed Work either prior to, or after, directing the Contractor to proceed.

4. In the event the County elects to evaluate a bid prior to directing the Contractor to proceed, the County will issue a notice describing the proposed Change Order in the form of a Request for "Quotations" (RFQ). If the Contractor does not respond within fourteen (14) days after receipt of the notice, or such other time as agreed upon, with an equitable adjustment requested in accordance with Paragraph B.5.(b) under "Equitable Adjustments," the County may issue a Change Order with no change in the Contract Amount or Contract Time. The Contractor shall not proceed with any aspect of the proposed changed Work, or delay, suspend, or interrupt any unchanged Work until the County issues the Change Order.

5. If, in the opinion of the Director, it is in the County's best interest and it is deemed necessary to proceed with a required change in the Contract Documents, and time precludes thorough analysis of the Contractor's proposal, or the parties fail to reach an agreement, the Director may order the Contractor to proceed (Proceed Order) on the basis of a tentative price based on the best estimate available at the time, with the firm price to be determined later. If a Proceed Order is issued, the Contractor shall submit his proposal for the changes in the Work within thirty (30) days after the Proceed Order or completion of the changed Work, whichever is later. All charges arising out of a Proceed Order are to be documented and verified in a manner acceptable to the Director.

6. In the event that the County requires certain Work to be accomplished and the Contractor fails in the discharge of any or all of his responsibilities described hereinbefore, the County may issue a Unilateral Change Order which is a change order issued by or at the direction of the County without the full and timely agreement of the Contractor.

   a. A Unilateral Change Order may be issued before, during or after the changed Work is physically accomplished under the following conditions:

      1. The Contractor fails to submit price and/or time extension proposal for the changed Work within thirty (30) days of receipt of the request for "Quotations" or within a reasonable time thereafter as specified by the County.

      2. The Contractor fails or refuses to execute a Change Order by affixing his signature thereto within thirty (30) days of receipt or within a reasonable time thereafter as specified by the County.

      3. The County notifies the Contractor in writing that the Change Order is considered to be unilateral and is to be an effective change to the Contract. A notation will be made on the face of the Change Order that it is unilateral and the effective date thereof. Normal distribution of copies will then be made.

7. Any other written order including direction, instruction, interpretation, or determination from the County that causes a change in the Contractor's obligations may be treated as a proposed Change Order as provided in Part B of this Article, "Constructive Changes."

8. Except as provided in this Article, no order, statement, or conduct of the County shall be treated as a Change Order under this clause or entitle the Contractor to an equitable adjustment.

9. No equitable adjustment request by the Contractor shall be allowed if asserted after Final Payment of the Contract.

B. Constructive Changes

1. Notice: The primary purpose of this paragraph is to obtain prompt reporting of County conduct or changed conditions either caused by an act of God (Public Contract Code Section 7105) or digging trenches or other excavations that extend deeper than four feet below the surface (Public Contract Code Section 7104) that the Contractor considers to constitute a change to this Contract. Except for changes identified as such in writing and signed by the County or the Director, the Contractor shall notify the County in writing within fourteen (14) days from the date of County conduct (including actions, inactions, and written communications) that the Contractor regards as a change to the Contract. On the basis of the most accurate information available to the Contractor, the notice shall state:

   a. The date, nature, and circumstances of the conduct regarded as a change;

   b. The name, function, and activity of each Contractor official, agent, or employee involved in or knowledgeable about such conduct;

   c. The identification of any documents and the substance of any communication involved in such conduct;

   d. In the instance of alleged acceleration of scheduled performance or delivery, the basis upon which it arose;

e. The particular elements of Contract performance for which the Contractor may seek an equitable adjustment under this clause, including:

1. What specific Contract Drawings or specific sections of the Specifications have been, or may be, affected by the alleged change;

2. What labor or materials or both have been, or may be, added, deleted, or wasted by the alleged change;

3. To the extent practical, what delay and disruption in the manner and sequence of performance and effect on continued performance have been, or may be, caused by the alleged change in accordance with Section 01 32 00, "Construction Schedule;" and

4. What adjustments to Contract Amount and other provisions affected by the alleged change are estimated;

f. The Contractor's estimate of the time by which the County must respond to the Contractor's notice to minimize cost, delay, or disruption of performance, in accordance with Section 01 32 00, "Construction Schedule."

2. Continued Performance: Following submission of the notice required by Paragraph B.1 of this Article above, the Contractor shall diligently continue performance of this Contract as though not changed by the conduct reported under Paragraph B.1 until notified of the County's response under Paragraph B.3 of this paragraph, below.

3. Response: The County will, within fourteen (14) days after receipt of notice, respond to the notice in writing. In responding, the County will either:

a. Confirm that the conduct of which the Contractor gave notice constitutes a change and, when necessary, direct the mode of further performance in accordance with Part A of this Article, "Written Changes;"

b. Countermand any communication regarded as a change;

c. Deny that the conduct of which the Contractor gave notice constitutes a change, and when necessary, direct the mode of further performance; or

d. In the event the Contractor's notice information is inadequate to make a decision under A, B, or C above, advise the Contractor what additional information is required, and establish the date by which it should be furnished and the date thereafter by which the County will respond.

4. Appeals: In the event the Contractor does not agree with the County's response under B.3 above, the Contractor may submit a request to the Disputes Review Board.

5. Equitable Adjustment:

a. If the County confirms that the County's conduct effected a change as alleged by the Contractor, the Contract will be modified in writing accordingly in conformance with Part A of this Article, "Written Changes". Except for a proposed change to the Drawings or Specifications, no request for equitable adjustment under this paragraph shall be allowed for any costs incurred more than fourteen (14) days before the Contractor gives written notice under Part B of this Article.

b. In the case of a necessary change to the Drawings or Specifications for which the County is responsible, the equitable adjustment shall include the cost and time extension for delay reasonably incurred by the Contractor in attempting to comply with the Drawings or Specifications before the necessary change is identified. When the cost of property made obsolete or in excess as a result of a change confirmed by the County under this paragraph is included in the equitable adjustment, the County will have the right to prescribe the manner of disposition of the property or its proceeds. The equitable adjustment shall not include increased costs or time extensions for delay resulting from the Contractor's failure to provide notice or to continue performance as provided respectively in Paragraphs (1) and (2) above of this part.

C. Compensation for Changes in the Work

1. Changes in the Work issued and signed by the Contractor pursuant to the requirements of this Contract represent and constitute full and final settlement for all costs and time (hereinafter referred to as compensation) associated with the Work (or event) described therein. Compensation is defined to include all direct and indirect labor costs, all material and equipment expenses, and all impact costs related to and/or occasioned by the Work described therein, as well as all taxes, insurance, and profit. It is agreed that the basis of compensation to the Contractor for Work either added or deleted by Changes in the Work shall be determined by one or more of the following methods below. All amounts for overhead, profit, insurance, and all other direct and indirect costs of the changes in the Work (except for bonds as provided in Paragraph C.2 shall be computed in accordance with percentages set forth in Paragraph C.1.c and C.8.c of this Article.

a. Method A

By unit prices for items of Work scheduled to be done under the unit price provisions of the Contract. The cost or credit for such added or omitted Work shall be determined by multiplying the number of units added to or omitted from the Work by the applicable unit price.

b. Method B

By agreed lump sum. All lump sum quotations prepared by the Contractor shall be supported by legible and itemized cost by trades. The itemized breakdown accompanying the quotation shall quantify all added and deleted labor, material, and construction equipment directly involved. The Contractor must also obtain and furnish with quotation, itemized breakdown(s) as described above, signed by each subcontractor or vendor participating in the change regardless of tier. All labor cost, including associated fringe benefits and insurance costs, shall be verified by certified payrolls and/or standard rates in accordance with the Prevailing Wage Scale.

c. Method C

If neither Method A nor Method B are agreed upon before the changes to the Work are commenced, then the Contractor shall be paid as follows:

The actual cost, documented to the satisfaction of the County, of labor, materials, and equipment furnished by the Contractor and/or the actual cost of subcontractor Work incurred by the Contractor as provided in Paragraph C.8, plus the following percentages which are considered fair and reasonable compensation for overhead, profit, insurance, and all other direct and indirect costs of the Changes in the Work (except for bonds as provided in Paragraph C.2:

18% of the cost of labor as provided in Paragraph C.3 where furnished by the Contractor;

15% of the cost of materials as provided in Paragraph C.4 where furnished by the Contractor;

10% of the actual cost of equipment as provided in Paragraph C.5; and

5% of the actual cost of the first tier subcontract Work as provided in Paragraph C.8.

Overhead charges shall include those charges as specified in Paragraph C.3.c below.

d. Unilateral Change Order

1. The terms of a Unilateral Change Order, including the change in Contract price and/or completion date shall, in the County's judgment, be fair and reasonable.

2. When a Unilateral Change Order has been issued, it will have the full force and effect of a Contract modification. It will be included in schedules, payment applications, reports, and all official records of the Contract. The issuance of a Unilateral Change Order will not prejudice any of the Contractor's rights to make claims or appeal disputed matters under other provisions of the Contract.

3. If the Contractor objects to a Unilateral Change Order, Contractor shall state, in writing, specific objections to, or specific points of disagreement with, the Work described in the Unilateral Change Order within thirty (30) days of receipt of such Change Order.

2. To the total additional cost of the Work as computed by any of the three above methods, the Contractor may add, upon furnishing to the County satisfactory evidence of the cost thereof, the actual cost of additional bond premiums incurred by the Contractor as a result of the additional cost to the Work up to a sum not to exceed 1.5 percent (1.5%) of the additional cost to the Work.

3. Labor: The cost of labor used in performing the Work, whether the employer is the Contractor, Subcontractor, or other forces, will be the sum of the following:

   a. The gross actual wages paid including income tax withholdings but not including any employer payments to or on behalf of the workmen for health and welfare, pension, vacation, insurance, and similar purposes.

   b. To the actual gross wages, as defined above, a percentage will be applied based upon current applicable labor rates concerning payments made to or on behalf of workmen other than actual wages. This percentage shall constitute full compensation for all payments other than actual gross wages as specified below. The Contractor shall compute a separate percentage for each craft, or a composite percentage for all crafts if so approved by the County. All computed percentages shall be submitted to the County for approval within thirty (30) days after receipt of Notice to Proceed with the changes to the Work or as directed by the County prior to any changed Work being performed.

   c. The charges for labor shall include all classifications through foremen when engaged in the actual and direct performance of the Work. They shall not include charges for such overhead personnel as superintendents, assistant superintendents, office personnel, timekeepers, and maintenance mechanics.

4. Materials: The cost of materials required for the accomplishment of the Work shall be the delivered cost to the purchaser, whether Contractor, subcontractor, or other forces, from the supplier thereof, except as the following are applicable:

   a. If cash trade discount by the actual supplier is offered or available to the purchaser, it shall be credited to the County if such discount was taken.

   b. If materials are procured by the purchaser by any method which is not a direct purchase from and a direct billing by the actual supplier, to such purchaser, the cost of such materials, including handling, shall be deemed to be the price to the actual supplier as determined by the County.

   c. If the materials are obtained from a supply or source owned wholly or in part by the purchaser, payment therefore will not exceed the lesser of the price paid by the purchaser for similar materials furnished from said source on Contract items or the current wholesale price for such materials delivered to the worksite, whichever price is lower.

   d. The cost of such materials shall not exceed the lowest current wholesale price at which such materials are available in the quantities concerned, delivered to the job site, less discounts as provided in Subparagraph 4.a.

   e. If the Contractor does not furnish satisfactory evidence of the cost of such materials from the actual supplier thereof, the cost shall then be determined in accordance with Subparagraph 4.d.

5. Equipment: Equipment rented/leased by the Contractor or subcontractor and utilized on this project for the purposes of this Article shall be paid for on the basis of arms-length rental agreements entered into and invoices paid by the Contractor or subcontractor for that equipment. These invoices shall be submitted as evidence of the expense incurred.

   a. The Contractor or subcontractor shall be paid for the use of owned equipment at prices for the use of machinery and equipment determined by using 80 percent (80%) of equipment

use costs published by the Associated Equipment Distributors, which edition is in effect at the time of the change. Contractor or subcontractor-owned equipment required to be on stand-by or to be present on the site, even though idle, shall be paid for at 50 percent (50%) of the owned equipment rate established above.

b. The Contractor or subcontractor shall furnish all data which might assist the County in the establishment of such rates.

1. Operators of equipment will be paid for as provided under Subparagraph C.3 above.

2. All equipment shall be in good working condition and suitable for the purpose for which the equipment is to be used. Contractor is responsible for any necessary repairs and ongoing maintenance of said equipment.

3. Unless otherwise specified, manufacturer's ratings and manufacturer modifications shall be used to classify equipment for the determination of applicable equipment rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

4. Individual pieces of equipment or tools having a new value of five hundred dollars ($500.00) or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefore.

6. Equipment Located at the Site: The time to be paid for equipment located at the site shall be the time the equipment is required for the changed Work being performed. Moving time, loading, unloading, and hauling will not be paid for if the equipment is already located at the Site.

7. Equipment Not Located at the Site: For the use of equipment moved to the Site and used exclusively for changed Work, the Contractor will be paid the rates hereinbefore specified, as follows:

a. The period shall begin at the time the equipment is unloaded at the site; shall include each day that the equipment is at the

site, excluding Saturdays, Sundays, and other legal holidays unless the changes to the Work are performed on such days; and shall terminate at the end of the day on which the County directs the Contractor to discontinue the use of such equipment. The maximum time to be paid per day will not exceed eight (8) hours without prior written approval from the Director.

b. Payment for transporting, loading, and unloading equipment will be made only when such equipment has been moved to the site for the sole and express purpose of accomplishing the changed Work.

8. Subcontracts: The cost for Subcontract work will be the actual cost to the Contractor or subcontractor for Work performed by a Subcontractor as follows:

a. The cost incurred by the first tier subcontractor for labor, materials, and equipment as limited by Paragraphs C.3, C.4, and C.5; plus

b. The following percentages which are considered fair and reasonable compensation for overhead, profit, insurance and all other direct and indirect costs of the changes in the Work (except for bonds as provided in Paragraph C.2:

18% of the cost of labor as provided in Paragraph C.3;

15% of the cost of materials as provided in Paragraph C.4;

10% of the cost of equipment as provided in Paragraph C.5.

c. To the total additional cost to the Work as computed in accordance with Paragraphs 8.a and 8.b above, the subcontractor, upon furnishing satisfactory evidence of the cost thereof, the actual cost of additional bond premiums incurred by the Subcontractor as a result of the additional cost to the Work up to a sum not to exceed 1.5 percent (1.5%) of the additional cost to the Work.

16. PROVISIONS FOR EXTRAS:

No new Work of any kind performed hereunder shall be considered as extra Work outside the scope of the Contract unless a separate estimate is given for said Work before it is commenced, the same is approved by the Department as reasonable and equitable, and it has been ordered under one of the three methods set forth in article, "CHANGES IN THE WORK," Paragraphs A, B, or C. Except for extra Work ordered by the Department according to unit prices or by changes or additions in the Work embraced in a Change Order issued by it, any extra Work performed will not be paid for by the County. The Contractor will prepare and submit change order requests as directed by the County Project Manager.

17. TIME EXTENSIONS AND COMPENSATION FOR DELAY:

A. Adjustments in the Contract Time shall be governed by the principles of this Article and shall be made in accordance with the conditions stated in Specification Section 01 32 00, Construction Schedule.

B. Actions or inactions of the County, or events for which the County has assumed contractual responsibility, which would independently delay the date of Substantial Completion beyond the current Contract Completion Date shall be designated as Compensable delays.

C. Events which are outside the control of, and without the fault or negligence of either the County or the Contractor, which would independently delay the date of Substantial Completion beyond the current Contract Completion Date shall be designated as Excusable delays. Unless the County considers that extreme circumstances warrant consideration, extensions of time because of inclement weather will not be granted.

D. Actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility, which would independently delay the date of Substantial Completion beyond the current Contract Completion Date shall be designated as non-excusable delays.

E. Concurrent delay is any combination of the above three types of delay occurring on a calendar date, except in cases where the combination consists of two or more instances of the same type of delay occurring on a calendar date.

F. Any event, action, inaction, or other cause which may give rise to a delay shall constitute a basis for adjustment in:

1. Contract Time, only if it can be demonstrated that the date of Substantial Completion will be delayed beyond the current Contract Completion Date and that the delay is classified as a Compensable or Excusable delay; and/or

2. Contract Amount, only if it can be demonstrated that the Contractor's time-related costs to complete the Work will be increased and the delay is classified as a Compensable delay.

18. OBSERVATION:

A. All Work shall meet with the approval of the Department and shall be completed in conformity with the Drawings and Project Manual approved by, and on file with, the Los Angeles County Board of Supervisors, such Drawings and the Project Manual will be made part of the Contract to be entered into for the Work referred to herein. The County at its discretion may require the contractor to obtain approval/clearance from the Inspector of Record for certain items to ensure the quality of the work.

B. The Department or its representative will have access to the Work at all times. The Contractor will furnish all facilities for inspection at the construction site, and at shops or yards, and shall not cover up any Work until the same has been approved by the Department. If Work should be covered up before being inspected, the Contractor will be required to remove such portions of the Work as may be necessary to disclose the part in question.

C. The County of Los Angeles or its authorized representatives will be given access to the Work at all times. Such access will not be subject to restrictions which are not directly related to the provision and maintenance of health and safety.

D. The Contractor will be issued a "Notice of Noncompliance" for any portion of the contract Work that does not satisfy the requirements of the Drawings and Specifications. No Work subject to a "Notice of Noncompliance" will be paid for by the County until such Work is brought into full compliance with the Drawings and Specifications to the satisfaction of the County. The Contractor must obtain the County’s approval for all corrected deficiencies and/or non-compliant work prior to proceeding with work that may be affected by the deficient and/or non-compliant work. The Contractor shall not build on or conceal work that is deficient and/or non-compliant. Furthermore, work

that is built or dependent upon item(s) that are deficient and/or not-compliant will not be approved on the progress payment request.

E. An Inspection Notice will be issued if the contract Work has not been executed in full compliance with the Drawings and Specifications. The Contractor is responsible for bringing all Work subject to an Inspection Notice into full compliance with the Drawings and Specifications at no additional cost to the County.

F. Technical Reports may be generated for the purpose of evaluating the quality, correctness, functionality, etc., of the Contractor's Work or performance under this contract in accordance with the requirements of the Drawings and Specifications.

19. PERMITS, LICENSES, AND INSPECTIONS:

A. The Contractor will obtain and pay for all permits required for the Work except the following "no-fee" permits: building, electrical, mechanical, plumbing, and sewer Work. Further, the Contractor will obtain and pay for all permits incidental to the Work or made necessary by Contractor's operation. This includes Contractor/Manufacturer designated structures such as prefabricated buildings, light poles, special shoring, and the like. The Contractor shall also pay for the plan check of prefabricated buildings.

B. To comply with Section 3800 of the Labor Code of the State of California, the Contractor and all Subcontractors requiring a permit (building, plumbing, grading, electrical, etc.) shall file a Workers' Compensation Certificate with the Department of Public Works, Business Relations and Contracts Division, Contracts Administration Section.

C. Exclusive of off-site inspection specified to be the County's responsibility, the Contractor will arrange and pay for all off-site inspection of the Work including certification thereof required by the specifications, drawings, or by governing authorities.

D. The County will provide on-site inspection of the Work and will arrange for off-site inspection when noted on the drawings and/or when specified in the various technical sections of the Specifications as the responsibility of the County. All other required inspection will be the responsibility of the Contractor.

E. The County will not pay any costs for licenses required in the performance of the Work. The Contractor shall assume this responsibility in total.

20. TESTS:

A. County's Responsibilities

1. The County reserves the right to test or require the Contractor to obtain "called tests" of any materials or performance over and above "required tests" as defined in the following Paragraph B.1, and provided such "called tests" show the Work meets the specified requirements, the County will pay for the cost of the tests. If the Contractor was required to obtain the test from a third party, the County will reimburse the Contractor on the basis of Contractor's certified statement of the results and costs, with appropriate supporting documentation.

B. Contractor's Responsibilities

1. The Contractor will arrange and pay for all tests of materials or performance as required by the Specifications or by ordinance or governing authority. These are defined as "required tests".

2. The Contractor shall pay for all "called tests" as defined in preceding subparagraph A.1, when the test results show the materials or performance fails to meet the specified requirements. Immediately thereafter, the Contractor, at Contractor's own expense, shall remove the improper Work and replace same with materials or performance meeting the specified requirements. The Contractor shall also bear the expense of any tests required of the replaced Work, and of any subsequent removal, replacement, and testing as may be necessary to obtain materials or performance meeting the specified requirements.

21. SUBSTANTIAL COMPLETION:

A. The date of Substantial Completion of the Work, or designated portion thereof as set forth in the Contract Documents, is the date certified by the County when construction is sufficiently complete, in accordance with the Contract Documents, so the County may occupy or use the Work, or designated portion thereof, for the use for which it is intended.

B. When the Contractor considers that the Work, or designated portion thereof as set forth in the Contract Documents, is substantially complete as defined above, the Contractor shall prepare for submission to the County a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the County determines that the Work or designated portion thereof is substantially complete, it will issue a Certificate of Substantial Completion which shall establish the date of Substantial Completion. The Certificate shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall list remaining items to be corrected or completed. The Work not fully completed or corrected shall be completed to the satisfaction of the County within thirty (30) calendar days after Substantial Completion, or within a period of time mutually agreed upon between the Contractor and the County. In the event the Contractor fails to complete or correct the remaining items within the allotted time, the County may complete or correct the items and deduct the cost thereof from the Contract amount.

C. Warranties required by the Contract Documents, as discussed in Article 40 of the General Conditions, shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

D. Upon Substantial Completion of the Work or designated portions thereof, and upon application of the Contractor, the County, in County's sole discretion, may release and/or reduce the amounts retained subject to the limitations of Public Contract Code Section 9203.

E. In accordance with the General Conditions, the County reserves the right to occupy substantially completed portions of the Work and any such portion shall be subject to the above provisions for Substantial Completion.

22. <u>OCCUPANCY BY THE COUNTY</u>:

A. The Contractor, Contractor's employees, and representatives will be admitted by the County to the premises for the purpose of executing the Work to be performed under this contract, but they shall have no tenancy.

B. It is further understood that the County shall have the right to take temporary possession of, or use any portion of, any substantially completed part of the Work. Before taking possession of any Work, the County shall furnish the Contractor a list of items of Work remaining to be performed or corrected on

those portions of the Work that the County intends to take possession of or use. However, a failure of the County to list any item of Work shall not relieve the Contractor of responsibility for complying with the terms of the Contract. The County's possession or use shall not be deemed an acceptance of any Work under the Contract.

C. While the County has such possession or use, the Contractor shall be relieved of the responsibility for the loss of, or damage to, the Work in place resulting from the County's possession or use. If prior possession or use by the County delays the progress of the Work or causes additional expense to the Contractor, an adjustment may be made in the Contract Amount or the Contract Time, under the applicable scheduling and cost provisions of this Contract.

23. WORKERS:

None but workers skilled in the various trades required on this contract shall be employed upon the Work. Any mechanic or laborer employed upon the Work who, in the opinion of the Department, is non-cooperative or who shall prove careless or incompetent, shall be immediately removed from the Work by the Contractor, when notified to do so, and shall not be re-employed upon the Work.

24. HOURS OF WORK:

Work in excess of eight (8) hours per day will be permitted by employees of contractors under this Contract only so long as Section 1815 of the Labor Code of California is complied with by such contractors.

25. SATURDAY, SUNDAY, HOLIDAY, AND OVERTIME WORK:

A. No construction Work shall be done on Saturdays, Sundays, or holidays recognized by the County government and no Work shall be performed outside of normal Working hours without the consent of the Department, unless required under these specifications. In any event, all Work shall be subject to approval of the Department. Prior to the start of such Work, the Contractor shall arrange with the Department for the continuous or periodical inspection of the Work and tests of materials, when necessary. If requests are made by contractors for permission to Work overtime, nights, Saturdays, Sundays, or holidays, and such requests are granted, the Contractor shall bear all extra expense to the County or the awarding entity for inspection and other incidental expenses caused by such overtime work. If Contractor is requested, in the interest of the awarding entity, to work overtime by the

Department; or if overtime Work is specifically required by these Specifications, all extra expense of inspection will be paid by the County. Should the Contractor find it necessary in order to complete the Work according to schedule to perform certain of Contractor's operations on Saturdays, Sundays, holidays or overtime, these operations shall be performed as part of the Work included in the contract price and shall not constitute a basis for additional payments. Refer to above paragraph for the obligations for the Contractor to assume the cost of inspections.

B. The County reserves the right to order in writing Work outside of normal working hours to avoid inconvenience of occupants of existing facilities or to perform special operations that, in the judgment of the Department best serve the intent of the Contract Documents and the orderly prosecution of the Work. If the County elects to order Work outside of normal working hours, the Contractor shall make all arrangements to supply an adequate Work force for the task to be accomplished and will be compensated for the premium portion of the wages paid, plus labor burdens applicable to the premium portion only of the wages paid. Contractor shall submit copies of Contractor's payrolls indicating the premium wages actually paid, and the County will issue a Change Order to reimburse the Contractor for Contractor's actual costs only.

26. PREVAILING WAGE SCALE:

A. The Contractor shall comply with all provisions of the Labor Code of the State of California.

B. Under the provisions of said Labor Code, the State Department of Industrial Relations will ascertain the prevailing hourly rate in dollars and details pertinent thereto for each craft, classification or type of workers, or mechanic needed to execute any contract which may be awarded by the awarding entity.

C. Particulars of the current Prevailing Wage Scale, which are applicable to the Work contemplated under these Specifications, are filed with the awarding entity and the Department and must be posted at the project site.

27. EMPLOYMENT OF INDENTURED APPRENTICES:

A. Contractor shall comply with Section 1777.5 and 1777.7, Labor Code, State of California.

B. All Contractors shall employ registered apprentices at a ratio of not less than one hour of apprentice's work for every five hours of labor performed by a journeyman. Contractors shall be responsible for the compliance of all Subcontractors.

C. Contractor and Subcontractors shall keep an accurate record showing the name of the craft and wage rate of each apprentice and journeyman employed by each entity. Subcontractor shall provide, weekly, such records to the Contractor. Records shall be made available to the Division of Apprenticeship Standards and the County of Los Angeles or the awarding entity, for the purpose of determining compliance. Failure to comply may result in withholding payments and other penalties as provided by the Labor Code.

28. AFFIRMATIVE ACTION PLAN FOR EQUAL EMPLOYMENT OPPORTUNITY:

A. The following provisions pertaining to equal employment opportunity are incorporated into this Contract. All references herein to "Contractor" shall be deemed to refer to the "general" Contractor.

B. During the performance of any construction Contract in excess of $10,000, the Contractor agrees as follows:

1. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor certifies and agrees that all persons employed by such firm, Contractor's affiliates, subsidiaries, or holding companies are, and will be, treated equally by the firm without regard to or because of race, color, religion, sex, or national origin and in compliance with all anti-discrimination laws of the United States of America and the State of California.

2. In all advertisements for labor or other personnel, or requests for employment of any nature, the Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3. The Contractor shall deal with Contractor's Subcontractors without regard to or because of race, color, religion, sex or national origin.

4. The Contractor shall comply with current Federal employment and reporting requirements for County-funded construction contracts.

Specifically, the Contractor shall make a good faith effort to comply with federal employment goals for minority and female employment and shall report minority and female employment data in a timely manner on the federal form provided by the contract awarding authority.

5. The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract of understanding, a notice, to be provided by the contract awarding authority, advising the said labor union or workers' representative of the Contractor's commitments under this section.

6. The Contractor shall allow the County access to Contractor's employment records during regular business hours to verify compliance with these provisions when so requested by the County.

7. The Contractor agrees that if the County finds that any of the above provisions has been violated, the same shall constitute a material breach of contract upon which the County may determine to cancel, terminate, or suspend the Contract. While the County reserves the right to determine independently that the anti-discrimination provisions of the Contract have been violated, in addition, a determination by the Federal Equal Employment Opportunity Commission or the California Fair Employment and Housing Commission that the Contractor has violated federal or state anti-discrimination laws may constitute a finding by the County of Los Angeles that the Contractor has violated the anti-discrimination provisions of the Contract.

8. At County's option, and in lieu of canceling, terminating, or suspending the Contract, the County may impose damages for any violation of the anti-discrimination provisions of this paragraph, in the amount of two hundred dollars ($200) for each violation found and determined. The County and Contractor specifically agree that the aforesaid amount shall be imposed as liquidated damages, and not as a forfeiture or penalty. It is further specifically agreed that the aforesaid amount is presumed to be the amount of damages sustained by reason of any such violation, because, from the circumstances and the nature of the violation, it is impracticable and extremely difficult to fix actual damages.

9. The Contractor shall include the provisions of the foregoing Paragraphs B.1. through B.8. in every subcontract, so that such

provisions will be binding upon each Subcontractor performing Work required by this contract.

29. PAYROLL RECORDS:

A. The Contractor shall comply with the requirements of Section 1771.4 and Section 1776 of the Labor Code, State of California. The Contractor and its subcontractors shall furnish the records specified in Section 1776 directly to the Labor Commissioner in an electronic format, in the manner prescribed by the Labor Commissioner, on the Department of Industrial Relations website. The Contractor and its subcontractors shall maintain payroll records as enumerated in Labor Code Section 1776 (a). When requested by the County, the Contractor and its subcontractors shall submit to the County a copy of all weekly certified payrolls, indicating that the wage rates are not less than those determined by the State of California Department of Industrial Relations and the classifications set forth for each laborer or mechanic conform with the Work they performed. Contractor shall submit a weekly payroll report" (Form 347, A-1-131, or similar) shall accompanied by a written declaration, made under penalty of perjury. The Contractor shall be responsible for the submission of copies of payrolls for all subcontractors within ten (10) days after their payroll period. Failure of the Contractor to comply with the Labor Code requirements to pay prevailing wages and to maintain certified payroll records may result in withholding from progress payments amounts for underpaid wages and penalties as authorized by the Labor Code.

B. When requested by the County, the Contractor, all subcontractors, and some subconsultants will be required to submit certain certified payrolls and labor compliance documentation electronically at the discretion of, and in the manner specified by the County.

Electronic submittal will be a web-based system, accessed on the World Wide Web by a web browser. The Contractor, its subcontractors, and certain subconsultants will be given a log on identification and password to access the web-based labor compliance reporting system.

Use of the web-based system will entail additional data entry of weekly payroll information including; employee identification, labor classification, total hours worked and hours worked on this project, wage and benefit rates paid, etc. In addition, the Contractor may use payroll and accounting software that is capable of interfacing with the web-based system. The payroll and accounting software must be capable of generating a 'comma delimited file'

or 'comma separated value (CSV) file' that will interface with the web-based system.

This requirement applies to all subcontractors, subconsultants, and vendors required to submit certified payrolls and provide labor compliance documentation. The information may be used to provide statistical informational data to public or jurisdictional agencies.

30. QUALITY OF WORK AND MATERIAL:

A. All materials, parts, and equipment furnished by the Contractor shall be new, first quality, and free from defects and imperfections. Workmanship shall be in accordance with the best standard practices.

B. Any item or Work installed by the Contractor, but not in conformance with the drawings and specifications, shall be removed by and at the Contractor's expense upon written request from the County.

C. If such items or Work are not removed or satisfaction obtained by the County within thirty (30) calendar days of such request, then the County may have such items or Work removed and Work completed to conform to drawings and specifications at the Contractor's expense.

31. RESPONSIBILITY OF CONTRACTOR AND OF CONTRACTOR'S REPRESENTATIVE ON THE WORK:

The Contractor shall give personal attention and supervision to the Work until same is entirely completed. In the absence of the Contractor from the Work, he shall have a representative in charge who shall be competent to superintend and direct the progress of the Work and who shall be authorized to receive instructions and to act for the Contractor on all matters related to the Work. The name of this representative shall be sent by letter to the Department immediately after the awarding of the contract.

32. REPAIRING DAMAGED WORK:

A. All portions of the Work that may be damaged by accident or in the course of or on account of building operations, or by reason of any other cause whatsoever during the progress of the Work, shall be carefully and neatly repaired or reconstructed and the whole left in first-class condition and turned over to the County ready for use.

B. Should any part of the Work of this contract be cut into or damaged by other Contractors, the Contractor and party causing such damage shall make adjustments between themselves relative to reconstruction or repairs and payment for same.

33. LIST OF SUBCONTRACTORS AND SUBLETTING WORK:

A. No part of the construction Work shall be done as piece Work, nor shall it be let to a Subcontractor after the execution of the original contract except as provided by law. In case part of the Work should be sublet, these General Conditions shall govern each trade insofar as they may apply to the Work of that trade.

B. Where more than one Contractor or where Subcontractors are engaged upon the Work, they shall coordinate their efforts (in accordance with Article 36 of these General Conditions regarding other contractors, or under the control and guidance of the General Contractor), and shall be responsible, one to the other, for any damage or injury to the work.

C. Bidders and Contractor shall be governed by the provisions of Sections 4100 to 4113, inclusive, of the Public Contract Code of the State of California. Bidders shall set forth in their Bids, on forms provided for same, the name and location of the mill, shop, or office of each Subcontractor who shall perform the Work or labor or render service to the Contractor in or about the construction of the Work, and the portion of the Work which shall be done by each Subcontractor.

D. No subcontract shall be assigned or transferred except as provided in the above sections of the Public Contract Code of the State of California.

E. In case any Work is let to a Subcontractor, the Contractor shall be at all times responsible for the Work so done to same extent as if the Contractor were doing or had done the Work.

F. If a Subcontractor is named who shall perform the Work or labor or render service to the Contractor with respect to a material specified or indicated by patent or proprietary name and/or by the name of the manufacturer, and such Subcontractor cannot reasonably act with like respect to the material offered as an equal then, the Bidder shall, in his Bid Form, include with the pertinent data to be listed on the "Equals" page(s), the name and address of the Subcontractor who shall act with respect to the equal material.

G. In accordance with Public Contract Code Sections 4100, et seq., the Bidder must list all subcontractors who shall perform in excess of one-half of one

percent of the Work. (See Subcontractors' Section of the Instructions to Bidders.)

34. ADVERTISING:

No advertising matter shall be attached or painted on surfaces of buildings, fences, or canopies, except that names of Contractors and Subcontractors, with their addresses and the designation of their particular branch, may be shown on signs of a removable type. Size and location of such signs shall be subject to approval of the Department. The Contractor shall provide a project identification signboard as specified.

35. CERTIFICATE AS TO COMPLIANCE WITH CERTAIN REGULATIONS:

A. The Contractor shall file with the Department, prior to the acceptance of the Work, a certificate in form, substantially as follows:

B. I (We) hereby certify that all Work has been performed and materials supplied in accordance with the drawings, specifications, and contract documents for the above Work, and that:

1. Not less than the prevailing rates of wages as ascertained by the Department has been paid to laborers, workers, and mechanics employed on this Work.

2. There have been no unauthorized substitution of Subcontractors; nor have any unauthorized subcontracts been entered into.

3. No subcontract was assigned or transferred or performed by anyone other than the original Subcontractor; except as provided in Sections 4100-4113, inclusive, of the Public Contract Code.

(Signed)_____
Contractor

36. COORDINATION WITH OTHERS AND OTHER CONTRACTS:

A. The County reserves the right to award other contracts for any Work on any portion of the project not included in this Contract.

B. Where coordination with other Contractors is required, the Contractor shall make the appropriate provisions in Contractor's CPM schedule for the access to the site by those Contractors, the schedules of Work developed by them,

and any coordination required between any of those Contractors and between any of them and this Contractor.

C. The Contractor shall perform the Work of the Contract so that it will properly coordinate and fit the Work performed by other Contractors. He shall give the other Contractors every reasonable opportunity to perform their Work, store materials, and place equipment thereof, and fit their Work to the Work of other Contractors. They shall furnish to the other Contractors all information necessary in order that they may properly connect and fit their Work to Contractor's in ample time, so that they may have reasonable opportunity to prepare their Work therefore. They shall make the Work of this Contract ready to receive the Work of the other Contractors at the time fixed thereof, and shall fit this Work to that of the other Contractors at the time fixed therefore.

D. The Contractor shall cooperate with others in the prosecution of all Work and shall not interfere with material, equipment, or workers of the County or other Contractors engaged by the County at the site of the Work.

E. All Contractors engaged in Work at the site shall have, insofar as practical, equal use of the premises and facilities. In case of disagreement regarding such use, the matter shall be referred to the Department, whose decision relative to said use shall govern.

F. If any part of the Contractor's Work depends on proper execution or results upon the Work of any other separate Contractor, the Contractor shall inspect and promptly report to the Director any apparent discrepancies or defects in such Work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report shall constitute an acceptance of the other contractor's Work as fit and proper to receive the Contractor's Work, except as to defects which may develop in the other separate contractor's Work after the execution of the Contractor's Work.

G. Should the Contractor cause damage to the Work or property of any separate Contractor on the project, the Contractor shall, upon due notice, settle with such other Contractor by agreement or arbitration if it will so settle. If such separate Contractor sues the County or initiates an arbitration proceeding on account of any damage alleged to have been so sustained, the County shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the County arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the County for all attorney's fees and court or arbitration costs which the County has incurred.

37. CONTRACTOR'S CONSTRUCTION EQUIPMENT:

The Contractor shall furnish and maintain all equipment such as stairs, ramps, runways, scaffolds, hoists, etc., required for the proper execution of the Work. All such equipment and construction shall meet all requirements of all ordinances and laws applicable thereto.

38. CONTRACTOR PERSONNEL:

A. The Contractor agrees to employ only orderly and competent workers, skillful in the performance of the type of Work required under this Contract, to do the Work and agrees that whenever the County informs the Contractor in writing that any workers on the Site are incompetent or disorderly, such Worker shall be discharged from the Work and shall not again be employed on the Work without the County's written consent.

B. The Contractor shall give adequate attention to the faithful prosecution and completion of this Contract and shall keep on the Site at all times during project's progress, competent personnel superintendent and any necessary assistants to supervise and direct the Work. Grounds for removal of Contractor personnel specifically include (but is not limited to) the failure or refusal of such personnel to adhere to the Contractor's planned Construction Schedule as developed by the Contractor under Section 01 32 00.

39. AUDITS AND RECORDS:

The Contractor shall maintain all data and records pertinent to the Work performed under this Contract, in accordance with generally accepted accounting principles, and shall preserve and make available all data and records until the expiration of four (4) years from the date of final payment under this Contract, or for such longer period, if any, as is required by applicable statute or by other articles of this Contract. The authorized representatives of the County shall have access to all such data and records for such time period to inspect, audit, and make copies thereof during normal business hours. Contractor covenants and agrees that it shall require that any subcontractor utilized in the performance of this Contract shall permit the authorized representatives of the Los Angeles County Department of Public Works to similarly inspect and audit all data and records of said Subcontractors relating to the performance of said Subcontractors under this Contract for the same time period.

40. WARRANTY AND CORRECTIONS TO WORK:

A. In addition to any other warranties in the Contract Documents, the Contractor warrants that Work performed under this Contract conforms to the Contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any Subcontractor or supplier at any tier.

B. Corrections to the Work may be required during construction or any applicable warranty period. At the County's option, the cost of such corrections may be withheld from progress payments.

C. This warranty shall continue for a period of one (1) year from the date of Substantial Completion of the Work. If the County takes occupancy of any part of the Work before Substantial Completion, a warranty covering that specific portion of the Work shall begin for a period of one year from the date the County takes beneficial occupancy. The County will notify the Contractor in writing of the scope of any partial occupancy and the specific items under warranty.

D. The Contractor shall remedy at the Contractor's expense any failure to conform to the requirements of the Contract Documents or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to County-owned or controlled real or personal property, when that damage is the result of:

1. The Contractor's failure to conform to or comply with Contract requirements; or

2. Any defect of Contractor-furnished equipment, material, workmanship, or design.

E. The Contractor shall restore any Work damaged in fulfilling the terms and conditions of this Article. The Contractor's warranty with respect to Work repaired or replaced shall be extended for one (1) year from the date of repair or replacement.

F. The Director shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

G. If the Contractor fails to remedy any failure, defect, or damage within ten (10) working days (or immediately in the case of an emergency where delay would cause serious risk of loss or damage) after receipt of notice, the County shall have the right to remove, replace, repair, or otherwise remedy the failure, defect, or damage, and all direct and indirect costs of such

removal, replacement, repair, and correction, including compensation for additional professional services, shall be paid by the Contractor.

H. With respect to all warranties, express or implied, from Subcontractors, manufacturers, or suppliers for Work performed and materials furnished under this contract, the Contractor shall:

1. Obtain all warranties that would be given in normal commercial practice;

2. Require all warranties to be executed, in writing, for the benefit of the County, if directed by the Director; and

3. Enforce all warranties for the benefit of the County, if directed by the Director.

I. In the event the Contractor's warranty has expired, the County may bring suit at County's expense to enforce a Subcontractor's, manufacturer's or supplier's warranty.

J. Unless a defect is caused by the Contractor or Subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the County, nor for the repair of any damage that results from any defect in County-furnished material or design.

K. This warranty shall not limit the County's rights under other articles of this Contract or as provided by law with respect to latent defects, gross mistakes, or fraud.

L. The terms of this Article do not relieve the Contractor of any legal liability for defects discovered after one year from the date of occupancy. The obligations imposed by this article shall survive termination of the Contract.

41. HAZARDOUS MATERIAL

A. Hazardous Material is any product, substance, chemical, crude oil (or any products, by-products, or fractions thereof), whose nature, quantity, and/or intensity of existence, use, manufacture, disposal, transportation, spill, release or effect, either by itself or in combination with other material or materials in, on or about the project site: (a) is or becomes potentially injurious to the public health, safety or welfare, environment, or the project site; (b) is or becomes regulated or monitored by any governmental authority; or (c) may, according to statutory or common law theory, such as nuisance

(public or private), waste, trespass, negligence, strict liability, or tort, be a basis for liability in tort, or be a basis for liability to third parties.

B. Contractor shall notify the County when the Contractor has reason to suspect the presence of any Hazardous Material on the project site, whether or not such material was generated by Contractor or the County.

C. In the event the presence of hazardous material is suspected or discovered on the project site, the County shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required.

D. Except as may be otherwise provided herein, the Contractor shall not be obligated to commence or continue Work in the affected area until any known or suspected hazardous material discovered on the project site has been removed, or rendered or determined to be harmless by the County, as certified by an independent testing laboratory and approved by the appropriate government agency.

E. In the event the presence of hazardous materials on the project site is not caused by the Contractor, the County shall pay for all costs of testing and remediation, if any, and shall compensate Contractor any additional costs incurred or project delay in accordance with the applicable provisions of changes in the work herein. In addition, the County shall defend indemnify and hold harmless the Contractor and its agents, officers, directors and employees from and against any and all claims, damages, losses, costs, and expenses incurred in connection with or arising out of relating to the performance of the Work in the area affected by the hazardous material.

F. In the event the presence of hazardous materials on the project site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the County for any additional costs incurred as a result of Contractor's generation of hazardous material on the project site. In addition, the Contractor shall defend, indemnify, and hold harmless the County and its Special Districts and agents, officers, and employees from and against any and all claims, damages, losses, costs, and expenses incurred in connection with, or arising out of, or relating to, the presence of hazardous material on the project site.

G. The terms of this hazardous material provision shall survive the completion of the Work and/or any termination of this Contract.

42. CONTRACTOR SAFETY REQUIREMENTS:

In the performance of this Contract, the Contractor shall comply with all applicable federal, state, and local laws governing safety, health, and sanitation.

A. **Jobsite Safety:** The Contractor shall be solely responsible for ensuring that all work performed under the Contract is performed in strict compliance with all applicable Federal, State and local occupational safety regulations. The Contractor shall provide at its expense all safeguards, safety devices, and protective equipment, and shall take any and all actions appropriate to providing a safe jobsite.

B. **Project Safety Official:** The Contractor shall designate in writing a Project Safety Official who shall be at the jobsite at all times, and who shall be thoroughly familiar with the Contractor's Injury and Illness Prevention Program (IIPP) and Code of Safe Practices (CSP). The Project Safety Official shall be available at all times to abate any potential safety hazards and shall have the authority and responsibility to shut down an operation, if necessary. Failure by the Contractor to provide the required Project Safety Official shall be grounds for the County to direct the cessation of all work activities and operations at no cost to the County until such time as the Contract is in compliance.

C. **Safety Indemnification:** To the extent allowed by law, the Contractor agrees to defend, indemnify and hold harmless the County and its officers, employees, and agents from and against any and all investigations, complaints, citations, liability, expense (including defense costs and legal fees), claims and/or causes of action for damages of any nature whatsoever, including but not limited to injury or death to employees of the Contractor, its subcontractors or County attributable to any alleged act or omission of the Contractor or its subcontractor which is in violation of any CAL/OSHA regulation. The obligation to defend, indemnify and hold harmless includes all investigations and proceedings associated with purported violations of Section 336.10 of Title 8 of the California Code of Regulations pertaining to multi-employer work sites. The County may deduct from any payment otherwise due the Contractor any costs incurred or anticipated to be incurred by the County, including legal fees and staff costs, associated with any investigation or enforcement proceeding brought by CAL/OSHA arising out of the Project.

43. INDEMNIFICATION:

A. Until the Work is completed and accepted by the awarding entity, the Contractor shall indemnify, defend, and hold harmless the County, its Special Districts, elected and appointed officials, officers, employees, agents, and trustees (the indemnified parties) from and against any and all liability, loss, injury, or damage including (but not limited to) demands, claims, actions, fees, costs and expenses (including attorney and expert witness fees) arising from or connected with the Contractor's acts and/or errors and omissions arising from and/or relating to the Project. This indemnification does not apply to liability caused by the active negligence of the County.

B. The Contractor shall assume all risks and bear all cost for loss of, damage to, or missing or stolen equipment, tools, vehicles, and materials owned, hired, leased, or used by the Contractor for this Project.

44. GENERAL INSURANCE REQUIREMENTS:

Without limiting the Contractor's indemnification, the Contractor shall provide and maintain, during the term of this Agreement, the insurance specified in this Agreement. Such insurance shall be primary to, and not contributing with, any insurance or self-insurance programs maintained by the County and such coverage shall be provided and maintained at the Contractor's own expense.

A. Evidence of Insurance: Certificate(s) or other evidence of coverage satisfactory to the County shall be delivered to the project contract administrator (as identified in the Invitation for Bids) at Los Angeles County Department of Public Works, Business Relations and Contracts Division, Contracts Administration Section, P.O. Box 1460, Alhambra, CA 91802-1460, prior to commencing services under this Agreement. Such certificate(s) or other evidence shall:

1. Specifically identify this Agreement, including the project name and specification number.

2. Clearly evidence all insurance required in this Agreement.

3. Contain the express condition that the County is to be given written notice by the issuing insurance company by mail at least 30 days in advance of cancellation for all policies evidenced on the certificate of insurance.

4. Include a copy of the additional insured endorsement to the commercial general liability policy, adding the indemnified parties (the

County of Los Angeles and its Special Districts) as insureds for all activities arising from this Agreement.

5. Show the Contractor's insurance as primary to the County's insurance and self-insurance programs. This may be evidenced by adding the following statement to the additional insured endorsement, "It is further agreed that the insurance afforded by this policy is primary to any insurance or self-insurance programs maintained by the additional insureds, and the additional insureds insurance and self-insurance programs are excess and non-contributing to the named insureds insurance."

6. Confirm deductibles or self-insured retentions shall not exceed $25,000, and the deductibles/retentions apply on a "per occurrence" or "per loss" basis. The County retains the right to require the Contractor to provide a bond guaranteeing payment of all such retained losses and costs attributable to the Contractor's retention, or, withhold payment to Contractor in the amount of all or any deductibles/retentions as the County deems appropriate.

B. Insurer Financial Ratings: Insurance is to be provided by an insurance company authorized to do business in California and acceptable to the County, with an A.M. Best rating of not less than A:IX, unless otherwise approved by the County.

C. Waiver of Subrogation: The Contractor agrees to release the indemnified parties and waive its rights of recovery against the indemnified parties under the insurance policies specified in this Agreement.

D. Cancellation of or Changes in Insurance: Contractor shall provide County with, or Contractor's insurance policies shall contain a provision that County shall receive, written notice of cancellation or any change in Required Insurance, including insurer, limits of coverage, term of coverage or policy period. The written notice shall be provided to County at least ten (10) days in advance of cancellation for non-payment of premium and thirty (30) days in advance for any other cancellation or policy change. Failure to provide written notice of cancellation or any change in Required Insurance may constitute a material breach of the Contract, in the sole discretion of the County, upon which the County may suspend or terminate this Contract.

E. Failure to Maintain Insurance: Contractor's failure to maintain or to provide acceptable evidence that it maintains the Required Insurance shall constitute a material breach of the Contract, upon which County immediately may withhold payments due to Contractor, and/or suspend or terminate this Contract. County, at its sole discretion, may obtain damages from Contractor

resulting from said breach. Alternatively, the County may purchase the Required Insurance, and without further notice to Contractor, deduct the premium cost from sums due to Contractor or pursue Contractor reimbursement.

F. Sub-Contractor Insurance Coverage Requirements: Contractor shall include all Sub-Contractors as insureds under Contractor's own policies, or shall provide County with each Sub-Contractor's separate evidence of insurance coverage. Contractor shall be responsible for verifying each Sub-Contractor complies with the Required Insurance provisions herein, and shall require that each Sub-Contractor name the County and Contractor as additional insureds on the Sub-Contractor's General Liability policy. Contractor shall obtain County's prior review and approval of any Sub-Contractor request for modification of the Required Insurance.

45. INSURANCE COVERAGE REQUIREMENTS--TYPES AND LIMITS:

The County's insurance requirements specify that Contractors should obtain coverage from insurance companies acceptable to the County who have a current A.M. Best rating of not less than A:IX. A Best rating of A:IX indicates that the company evidences strong financial strength and ability to meet their ongoing financial obligations to policyholders.

A. Builders Risk Course of Construction Insurance: Such coverage shall:

1. Insure against damage from perils covered by the Causes-of-Loss Special Form (ISO form CP 10 30), and be endorsed to include earthquake, flood, ordinance or law coverage, coverage for temporary offsite storage, debris removal, pollutant cleanup and removal, testing, preservation of property, excavation costs, landscaping, shrubs and plants and full collapse coverage during construction (without restricting collapse coverage to specified perils).

2. If Contractor's work involves testing air conditioning systems, boilers, pressure vessels, major machinery or major electrical panels, policy shall include coverage for such testing.

3. Be written on a completed-value basis and cover the entire value of the construction Project, including County-furnished materials and equipment, against loss or damage until completion and acceptance by the County. See Supplementary Conditions, Section 00 08 00, Article 7, Insurance Coverage Requirements—Types and Limits, for additional information regarding replacement value of County-furnished materials and equipment.

B. General Liability Insurance: Such coverage shall be written on ISO policy form CG 00 01 or its equivalent. See Supplementary Conditions, Section 00 08 00, Article 7, Insurance Coverage Requirements—Types and Limits, for additional information regarding limits, occurrence, policy aggregate, and products/completed operations aggregate.

C. Automobile Liability Insurance: Such coverage shall be written on ISO form CA 00 01 or its equivalent. Such insurance shall include coverage for all "owned," "hired," and "non-owned" automobiles, or coverage for "any auto." See Supplementary Conditions, Section 00 08 00, Article 7, Insurance Coverage Requirements—Types and Limits, for additional information regarding liability limits.

D. Workers Compensation and Employers Liability Insurance: Such coverage shall provide workers compensation benefits, as required by the Labor Code of the State of California. Such policy shall be endorsed to waive subrogation against the County for injury to the Contractor's employees. If the Contractor's employees will be engaged in maritime employment, the coverage shall provide the benefits required by the U.S. Longshore and Harbor Workers Compensation Act, Jones Act, or any other Federal law to which the Contractor is subject.

1. In all cases, the above insurance shall include Employers Liability coverage with limits not less than:

a.	Each accident:	$1 million
b.	Disease – policy limit:	$1 million
c.	Disease – each employee:	$1 million

E. Performance Security Requirements:

Prior to execution of the Contract, the Contractor shall file surety bonds with the County in the amounts and for the purposes noted below, and on bond forms provided by the County. All bonds issued in compliance with the Contract shall be duly executed by a solvent surety company that is authorized by the State of California, is listed in the U.S. Department of Treasury's Listing of Approved Sureties (Annual Circular 570) and is satisfactory to the County, and it shall pay all premiums and costs thereof and incidental thereto (see http://www.fms.treas.gov/c570/).

1. Materials and Labor Bond (Payment Bond): Shall be in the sum of not less than 100% of the Contract price to assure the payment of claims

of material men supplying materials to the Contractor, subcontractors, mechanics, and laborers employed by the Contractor on the Work. This bond shall be so conditioned as to inure to the benefit of persons furnishing materials for or performing labor upon the Work. This bond shall be maintained by the Contractor in full force and effect until the Work is completed and accepted by the County, and until all claims for materials, labor, and subcontracts are paid.

2. Bond for Faithful Performance: Shall be in the sum of not less than 100% of the Contract price to assure the faithful performance of the Contract. This bond shall be so conditioned as to assure the faithful performance by the Contractor of all Work under said Contract, within the time limits prescribed, including any maintenance and warranty provisions, in a manner that is satisfactory and acceptable to the County, that all materials and workmanship supplied by the Contractor will be free from original or developed defects, and that should original or developed defects or failures appear within a period of one year from the date of acceptance of the Work by the County, the Contractor shall, at Contractor's own expense, make good such defects and failures and make all replacements and adjustments required, within a reasonable time after being notified by the County to do so, and to the approval of the Department of Public Works. This bond shall be maintained by the Contractor in full force and effect during the performance of the Work of the Contract and for a period of one year after acceptance of the Work by the County.

Each bond shall be signed by both the Contractor (as Principal) and the surety.

Should any surety or sureties upon said bonds or any of them become insufficient or be deemed unsatisfactory by the County, the Contractor shall replace said bond or bonds with good and sufficient sureties within ten days after receiving notice from the County that the surety or sureties are insufficient or unsatisfactory. Should any surety or sureties be deemed insufficient or unsatisfactory, no payment(s) shall be deemed due or will be made under this Contract until the new sureties shall qualify and be accepted by the County.

46. Not used.

47. Not used.

48. ASSIGNMENT:

A. The Contractor shall not assign this Contract without the consent of the County. The Contractor shall be bound by and comply with all applicable provisions of the Labor Code of the State of California and shall keep informed of and observe and comply with and cause all of Contractor's agents and employees to observe and comply with all federal, state, and local laws which in any way affect the conduct of the Work of this Contract.

B. Work performed on County-owned property, irrespective of political subdivision location, shall be governed by the County Building Laws, and Work performed outside the property lines of County-owned property shall be governed by the local laws of the County, city, or other municipal government having jurisdiction.

49. PATENTS:

In the event that any patented article, material, or process is to be installed or used in the performance of the Work as shown on the drawings or particular specifications therefore, the Contractor shall pay the royalty chargeable and shall save, keep, and bear the County harmless from all damage, costs, and expenses by reason of any infringement of the patent therefor, or by reason of the failure to pay the royalty chargeable for use thereof, and any loss to the County or the awarding entity in the event that the County is enjoined from using such patented article or material and the incidental damage caused by the loss of use and damage to County property or awarding entity in removing same, and cost of replacing the article or material the use of which is enjoined. Provided further the Bond for Faithful Performance shall be deemed to expressly apply to this provision of the specifications.

50. SUSPENSION AND/OR TERMINATION OF WORK AND/OR CONTRACT:

A. Suspension of Work

1. The Director may order the Contractor in writing to suspend, delay or interrupt all or any part of the Work for such period of time as he may determine to be appropriate for the convenience of the County.

2. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize incurring costs allocable to the Work covered by the order during the period of Work stoppage.

3. If the performance of all or any part of the Work is, for an unreasonable period of time, suspended, delayed, or interrupted by (a) an act of the County in the administration of this Contract, or (b) by the County's failure to act within the time specified in this Contract (or, if no time is specified, within a reasonable time), an adjustment shall be made for any increase in cost of performance of this Contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption, and the Contract modified in writing accordingly. However, no adjustment shall be made under this Article for any suspension, delay, or interruption to the extent (a) that performance would have been suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or (b) for which an adjustment is provided for or excluded under any other provision of this Contract.

4. No claim under this paragraph shall be allowed (a) for any costs incurred more than fourteen (14) calendar days before the Contractor shall have notified the County in writing of the act or failure to act involved, (but this requirement shall not apply as to a claim resulting from a suspension order), and (b) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment. No part of any claim based on the provisions of this clause shall be allowed if not supported by adequate evidence showing that the cost would not have been incurred but for a delay within the provisions of this Article.

B. Termination for Convenience

1. The Director may, whenever the interests of the County so require, terminate this Contract, in whole or in part, for the convenience of the County. The County shall give written notice of the termination to the Contractor specifying the part of the Contract terminated and the date termination becomes effective.

   a. The Contractor shall incur no further obligations in connection with the terminated Work, and, on the date set in the notice of termination, the Contractor shall stop Work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated Work. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated Work. The County may direct the Contractor to

assign the Contractor's right, title, and interest under the terminated orders or subcontracts to the County. The Contractor must still complete the Work not terminated by the notice of termination and may incur obligations as are necessary to do so.

b. The County may require the Contractor to transfer title and deliver to the County in the manner and to the extent directed by the County: (a) the fabricated or unfabricated parts, Work in process, completed Work, supplies, and other material produced or acquired for the Work terminated; and (b) the completed or partially completed plans, drawings, information, and other property that, if the Contract had been completed, would be required to be furnished to the County. The Contractor shall, upon direction of the County, protect and preserve property in the possession of the Contractor in which the County has an interest. If the County does not exercise this right, the Contractor shall use its best efforts to sell such supplies and manufacturing materials for the benefit of the County.

c. If the parties are unable to agree on the amount of a termination settlement, the County shall pay the Contractor the following amounts:

1. For Contract Work performed before the effective date of termination, the total (without duplication of any items) of:

(a) The percentage of the Contract price which equals the percentage (%) of Work completed in accordance with the schedule of values, less prior progress payments, and any applicable Liquidated Damages. The amounts of outstanding Stop Notices shall be withheld until the Stop Notices are resolved as provided by law.

(b) The cost of settling and paying terminated subcontracts and orders that are properly chargeable to the terminated portion of the Work;

2. The reasonable costs of effectuating the settlement of the Work terminated, including:

(a) Accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement bids and supporting data;

(b) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(c) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

C. Termination for Default

1. If the Contractor refuses or fails (a) to commence the Work within the time required by this Contract, (b) to prosecute the Work or any separable part with the diligence that will ensure completion within the time specified in this Contract, including any authorized extension, (c) to provide sufficient and properly skilled workers or proper materials or equipment to complete the Work in an acceptable manner and without delay, (d) to promptly pay its subcontractors, laborers, and materialmen, (e) to perform any of Contractor's other obligations under this Contract, or (f) to complete the Work within the time specified in this Contract ("events of default"), the County may, by written notice to the Contractor, terminate the right to proceed with the Work (or the separable part of the Work). In this event, the County may take over the Work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the site necessary for completing the Work. The Contractor and Contractor's sureties shall be liable for any damage to the County resulting from events of the default, whether or not the Contractor's right to proceed with the Work is terminated. This liability includes any increased costs incurred by the County in completing the Work.

2. The Contractor's right to proceed shall not be terminated because of delays, nor will the Contractor be charged with damages under this article, if:

a. The delay in completing the Work arises from unforeseeable causes beyond the control and without the fault or negligence

of the Contractor (examples of such causes include: (i) acts of God, (ii) acts of the public enemy, (iii) acts of the County in either its public or contractual capacity, (iv) acts of another Contractor in the performance of a contract with the County, (v) fires, (vi) floods, (vii) epidemics, (viii) quarantine restrictions, (ix) strikes, (x) freight embargoes, (xi) unusually severe weather, or (xii) delays of Subcontractors or Suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the Subcontractors or Suppliers); and,

b. The Contractor, within fourteen (14) calendar days from the beginning of any delay (unless extended by the County), notifies the County in writing of the causes of the delay in accordance with Specification Section 001310, Construction Schedule. The County shall ascertain the facts and the extent of the delay. If, in the judgment of the County, the findings warrant such action, the time for completing the Work shall be extended by Change Order. The findings of the County will be final and conclusive on the parties.

3. If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the County.

4. The rights and remedies of the County in this article are in addition to any other rights and remedies provided by law or under this Contract. Time is of the essence for all delivery, performance, submittal, and completion dates in this Contract.

D. <u>Termination for Improper Consideration</u>

1. County may, by written notice to Contractor, immediately terminate the right of Contractor to proceed under this Contract if it is found that consideration, in any form, was offered or given by Contractor, either directly or through an intermediary, to any County officer, employee, or agent with the intent of securing the Contract or securing favorable treatment with respect to the award, amendment, or extension of the Contract or the making of any determinations with respect to the Contractor’s performance pursuant to the Contract. In the event of such termination, County shall be entitled to pursue the same

remedies against Contractor as it could pursue in the event of default by the Contractor.

2. Contractor shall immediately report any attempt by a County officer or employee to solicit such improper consideration. The report shall be made either to the County manager charged with the supervision of the employee or to the County Auditor-Controller's Employee Fraud Hotline at (213) 974-0914 or (800) 544-6861.

3. Among other items, such improper consideration may take the form of cash, discounts, services, the provision of travel or entertainment, or tangible gifts.

E. Notice of suspension or termination for any reason shall be given in writing and shall be complete one day after deposit in the United States mail in a sealed envelope with postage prepaid and directed to the Contractor at Contractor's address as filed with the County, or upon personal delivery to any person whose actual knowledge of such suspension or termination would be sufficient notice to the Contractor. Actual knowledge of such suspension or termination by an individual Contractor or by a copartner, if the Contractor be a partnership or by the president, vice-president, secretary or general manager, if the Contractor be a corporation, or by the managing agent regularly in charge of the Work on behalf of said Contractor, shall in any case be sufficient notice.

51. CONTRACTOR'S WARRANTY OF ADHERENCE TO COUNTY'S CHILD SUPPORT COMPLIANCE PROGRAM:

A. Contractor acknowledges that County has established a goal of ensuring that all individuals who benefit financially from County through Contract are in compliance with their court-ordered child, family, and spousal support obligations in order to mitigate the economic burden otherwise imposed upon County and its taxpayers.

B. As required by County's Child Support Compliance Program (County Code Chapter 2.200) and without limiting Contractor's duty under this Contract to comply with all applicable provisions of law, Contractor warrants that it is now in compliance and shall, during the term of this Contract, maintain compliance with employment and wage reporting requirements as required by the Federal Social Security Act (42 USC Section 653a) and California Unemployment Insurance Code Section 1088.5, and shall implement all lawfully serviced Wage and Earnings Withholding Orders or District Attorney Notices of Wage and Earnings Assignment for Child or Spousal Support,

pursuant to Code of Civil Procedure Section 706.031 and Family Code Section 5246(b).

C. Failure of Contractor to maintain compliance with these requirements shall constitute a default by Contractor under this Contract. Without limiting the rights and remedies available to County under any other provision of this Contract, failure to cure such default within ninety (90) days of notice by the Los Angeles County District Attorney shall be grounds upon which the County Board of Supervisors may terminate this Contract.

52. CONTRACTOR'S ACKNOWLEDGMENT OF COUNTY'S COMMITMENT TO CHILD SUPPORT ENFORCEMENT:

Contractor acknowledges that County places a high priority on the enforcement of child support laws and the apprehension of child support evaders. Contractor understands that it is County's policy to encourage all County Contractors to voluntarily post County's L.A.'s Most Wanted: Delinquent Parents poster in a prominent position at Contractor's place of business. County's District Attorney will supply Contractor with the poster to be used.

53. LIMITATION OF LIABILITY:

A. This project may be awarded by or the Contract may be assigned to a joint powers authority or a nonprofit corporation established by the awarding entity. Bonds, certificates of participation, or other evidences of indebtedness will be issued by a joint powers authority or nonprofit corporation or the awarding entity or the County, for the purpose of constructing the Work contemplated by these Drawings and Specifications. The proceeds of said sale shall be the sole source of funds for payment of all Work to be done and all claims of any kind that may be made under the provisions of this Contract. Neither the awarding entity, nor (if different) the issuing entity, nor any individual parties thereto, nor the County, nor the County's agents and Special Districts, shall have any liability whatsoever to the Contractor or others arising out of, or in any way connected with, Work to be performed hereunder, save and except as such liability may be paid and discharged out of said proceeds, and except as specifically provided for in these specifications. Contractor shall look solely to said proceeds for payment of Work to be done or any claims whatsoever that may be asserted hereunder. Contractor expressly releases and discharges the awarding entity, the issuing entity, and the County and each of them from any and all liability, cost, or expenses save and except such liability, cost, and expense as may be paid for out of said proceeds.

B. The issuing entity will adopt a policy to sell and issue bonds, certificates of participation, or other evidences of indebtedness at such times and in sufficient amounts to ensure that funds are provided for the prompt payment, as installments become due, for Work performed hereunder.

54. FORUM SELECTION:

Contractor hereby agrees to submit to the jurisdiction of the courts of the State of California. The exclusive venue of any action brought by Contractor, on Contractor's behalf or on the behalf of any Subcontractor, which arises from this agreement or is concerning or connected with services performed pursuant to this agreement, shall be deemed to be in the courts of the State of California located in Los Angeles County, California.

55. WAIVER:

The waiver by the County of any term, covenant, or condition herein contained shall not be deemed to be a waiver of such term, covenant, or condition on any subsequent breach of the same or any other term, covenant, or condition herein contained.

56. PRIOR AGREEMENTS:

This Contract contains all of the agreements of the parties hereto with respect to any matter covered or mentioned in this agreement and no prior agreements or understanding pertaining to any such matter shall be effective for any purpose. No provision of this Contract may be amended or added to except by an agreement in writing signed by the parties hereto or their respective successor-in-interest.

57. PROGRESS PAYMENTS:

In accordance with Public Contract Code Section 20104.50, the County shall make progress payments within thirty (30) days after receipt of an undisputed and properly submitted payment request from a Contractor on a construction contract. Interest shall be paid to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure if the County fails to make payment within the thirty (30) days. If the payment request is determined not to be a proper payment request suitable for payment, it shall be returned to the Contractor as soon as practicable, but not later than seven (7) days after receipt accompanied by a document setting forth in writing the reasons why the payment request is not proper. The Contractor will prepare and submit progress payments as directed by the County Project Manager.

58. ACCEPTANCE OF FINAL PAYMENT AS RELEASE:

The acceptance by the Contractor of the final payment shall be and shall operate as a release to the County and the awarding entity of all claims and all liability to the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the County, awarding entity, and others relating to or arising out of this Work. No payment, however final or otherwise, shall operate to release the Contractor or his sureties from any obligation under this contract or the Performance and Payment Bond.

59. SUBSTITUTION OF SECURITIES FOR RETENTION:

In accordance with Public Contracts Code Section 22300 et seq., the Contractor may substitute securities for retention monies to be withheld to ensure performance under this Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld may be deposited with the County, or with an approved State or Federally chartered bank as the escrow agent. The County will then pay such retention moneys to the Contractor. It is the Contractor's obligation to secure the services of a state or federally chartered bank to act as escrow agent. Securities eligible for investment include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit. The Contractor shall be the beneficial owner of any securities substituted for retention monies withheld and shall receive any interest earned by the securities. The standard form of the County's Escrow Agreement is on file at the Business Relations and Contracts Division of the Department of Public Works. The terms of that Agreement are incorporated by reference.

60. RESOLUTION OF CONSTRUCTION CLAIMS:

The provision of Public Contract Code 20104 et seq. relating to the resolution of construction claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a Contractor and a local agency are hereby incorporated in this Contract.

61. CONFLICT OF INTEREST:

No County employee whose position in County enables him to influence the award of this agreement or any competing agreement, and no spouse or economic dependent of such employee, shall be employed in any capacity by Contractor herein, or have any other direct or indirect financial interest in this Agreement.

62. ANTI-TRUST CLAIMS:

In entering into a public works Contract or a Subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the 44 Cartwright Act (Chapter 2, commencing with Section 16700, of Part 2, Division 7, of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works Contract or Subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

63. COUNTY'S QUALITY ASSURANCE PLAN:

The County or its agent will evaluate Contractor's performance under this agreement on not less than an annual basis. Such evaluation will include assessing Contractor's compliance with all contract terms and performance standards. Contractor deficiencies which County determines are severe or continuing, and that may place performance of the agreement in jeopardy if not corrected, will be reported to the Board of Supervisors. The report will include improvement/corrective action measures taken by the County and Contractor. If improvement does not occur consistent with the corrective action measures, County may terminate this agreement or impose other penalties as specified in this agreement.

64. LAWS, CODES AND REGULATIONS TO BE OBSERVED:

A. The Contractor shall become familiar and comply with all Federal, State, County and City laws, ordinances or regulations controlling the action or operation of those engaged in the work, or affecting materials used, and operate in accordance therewith.

B. In accordance with this requirement, it has not been considered necessary to enumerate all wiring, plumbing and other requirements covered by the codes. The Contractor, in making a bid, agrees that the requirements of such ordinances will be as carefully adhered to as if they were specifically set forth in the specifications.

C. The Contractor shall hold harmless the County and all of its officers, agents and servants against any claims or liability arising from, or based upon the violation of such laws, by-laws, ordinances, regulations, orders or decrees, whether by the Contractor or the Contractor's employees, except where the instance of violation is done in accordance with the specifications.

D. Work performed on County-owned property, irrespective of political subdivision location, shall be governed by the County Building Laws; and work performed outside the property lines of County-owned property shall be governed by the local laws of the County, City, or other municipal government having jurisdiction.

* * *

(00700.REV 5/2008)

SECTION 00 08 00

SUPPLEMENTARY CONDITIONS

1. DEFINITIONS:

Whenever the following words appear in the Contract Documents, they will be construed to have the following meanings:

a. "County" means the County of Los Angeles.

b. "Awarding Entity/County" means either the County; the County, as agent for such joint powers authority or nonprofit corporation as may be involved in the issuance of bonds, certificates of participation or other evidences of indebtedness to finance the work contemplated herein; or said joint powers authority or nonprofit corporation.

c. "Board of Supervisors" means the Board of Supervisors, County of Los Angeles, California.

d. "Department" means the Department of Public Works.

e. "Owner" means the County of Los Angeles, represented by the Department of Public Works.

f. "Director" means the Director of the Department of Public Works or his authorized representative.

g. "Architect" means La Canada Design Group, or their authorized representative.

h. "Project Manual" means the manual prepared for the project, consisting of the Bid and Contract Requirements, Conditions of the Contract, and Technical Specifications.

I. "Contract" means the agreement which has been executed by the Contractor and the County.

j. "Contract Documents" means those documents identified in Paragraph 5 of the General Conditions.

k. "Contractor" means the Prime Contractor awarded the Contract by the Board of Supervisors.

l. "Award of Contract" means the date the Board of Supervisors awards the construction Contract to the Contractor.

m. "Notice to Proceed" means the date the Director authorizes the Contractor to proceed with the Contract work.

n. "Acceptance of the Project" means Los Angeles County Board of Supervisors or Director's acceptance of the work.

o. "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The work may constitute the whole or a part of the project.

p. "The Project" is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include Work by the County or others.

q. "Substantial Completion" means the Date of Substantial Completion of the Work, or designated portion thereof as set forth in the Contract Documents, certified by the County when construction is sufficiently complete, in accordance with the Contract Documents, so the County may occupy or use the Work, or designated portion thereof, for the use for which it is intended.

r. "Disputes Review Panel" reviews all matters related to disputes over the interpretation of the Drawings and Specifications.

s. "Notice to Bidders" means any written modification to the Contract Documents issued prior to the bid date.

t. "Day" means calendar day unless otherwise specified.

u. "Drawings" means the graphical and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the work, generally including plans, elevations, sections, details, schedules, and diagrams.

v. "Specifications" means that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the work, and performance of related services.

w. "Inspection Notice": A sequentially numbered written notice issued to the Contractor for the purpose of, but not limited to, the following:

1) Define items/installations that deviate from the Contract Documents and which payment may be withheld.

2) Alert as to problem areas prior to issuing Noncompliance.

3) Void previously issued Inspection or Noncompliance Notice when corrections have been made.

4) Give notice of approval.

5) Provide general project information.

6) Define delinquent submittals.

7) Advise Contractor of not complying with safety requirements.

x. "Noncompliance Notice": A sequentially numbered written notice issued to the Contractor that defines materials, installations, and/or situations that do not comply with codes or the Contract Documents and which payment cannot be made. The statement "remove and replace" will be included when required.

2. PAYMENTS:

Payments on account of the Work comprising the original Contract shall be made upon demand of the Contractor as follows:

a. A working day of the month shall be selected by the County and the Contractor, which day shall remain constant throughout the life of the project, and vary only as needed to fall on a working day. A payment request equal to ninety-five percent (95%) of the labor performed and material actually installed in the work during the previous thirty (30) days or since the last payment request shall be submitted by the Contractor and presented to the County for payment.

b. A payment request for the 5% withheld from the monthly progress payments shall be submitted by the Contractor to the County upon completion and acceptance by the County of all the work called for under the original Contract.

c. In the event of payment on account of additional work for a Change Order, supplemental agreement, or unit price authorization, the retention shall be as stipulated by the original Contract.

d. When progress payments are to be made, no payment on account of the work and at any time while there is work in progress, will be considered an acknowledgment that any or certain portions of the work have been done in accordance with the Drawings and Specifications. Should there be any balance due the Contractor at the time of the acceptance of the work such balance shall be paid upon said acceptance.

e. All demands for payment shall be itemized and rendered in six (6) copies by the Contractor and shall be certified by the Director when found by him to be correct. Payment will be made to the Contractor within thirty (30) days after the approval by the Director.

f. Cost of bonds or liability insurance shall not be included as an item in the demands for monthly progress payments. In the compilation of demands for progress payments, neither stipulated nor bid unit prices for deductions shall be used as the basis for computing prices for the work completed.

g. When the Contractor has requested payments that would bring his total payment to fifty percent (50%) of the Contract, all subcontractors and material suppliers on record with the Contract Administrator will be notified by U. S. Mail regarding the status of such payment.

   Subcontractors and material suppliers of record will be advised to refer to their rights under the Civil Code relating to the "Stop Notices" and other means or methods of securing payment for their work or materials.

3. PAYMENT FOR STORED MATERIAL:

The Department, at its discretion, may authorize "Progress Payments" at the invoiced price, minus retention specified under "Payments", for:

a. Material and equipment delivered to the site but not incorporated in the Work.

b. Material and equipment delivered and stored off the site in a bonded warehouse or other location within Los Angeles County, which warehouse or other location is satisfactory to and has been approved by the Department.

c. The provisions allowing prepayment for materials will be applied to large items of equipment and construction materials of special manufacture or order for the job, such as:

1. Electrical switchgear, generators, and transformers over 15 KVA.

2. Mechanical items including air handlers over 15 horsepower, boilers, chillers, and fabricated ductwork.

3. Reinforcing steel and structural steel when fabricated to job requirements.

4. Carpeting, floor tile or ceiling tiles.

5. Electrical fixtures (less lamps) and light standards.

6. Door and security hardware.

7. Window wall assemblies.

8. Precast concrete members such as wall panels, "tees" or girders.

Contractor must furnish with his Request for Payment acceptable evidence showing such material and/or equipment has been paid for in full, together with a verified statement that same is/are free from all liens and encumbrances and will be utilized in the Work covered by this Contract and a material list sufficient for physical inventory at the storage location. All shop drawings and material submittals must be approved prior to authorizing payments.

All storage, handling and rehandling costs, insurance and responsibility for protection and proper installation of such material and equipment, is the obligation of the Contractor. No payment, pursuant to this provision for material or equipment, shall in any way relieve the Contractor of its responsibility to obtain or provide, at its expense, any such material or equipment, or release the Contractor from any of its obligations under this Contract.

Department may enter upon the premises where the material and/or equipment is stored for inspection, checking, or any other purpose it deems necessary. The Contractor will be reimbursed for any Los Angeles County taxes levied against such material or equipment while so stored, upon presentation of a receipted tax bill for same.

4. <u>EQUIPMENT LAYOUT DRAWINGS</u>:

When any section of the specifications requires the submittal of an "Equipment Layout Drawing", the Contractor shall coordinate all work under various sections of the Specifications to assure that no interferences occur in the rooms or areas for which such drawings have been required and that necessary clearances are provided.

Installation of affected equipment shall not proceed until required drawings have been approved by the Department.

5. AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS:

The following forms and reports are required to be completed by the Contractor and/or Subcontractors according to the instructions furnished for each and at the time shown below for each:

a. Within ten (10) working days of subcontract award:

- Contractor's Notification of Subcontracts Awarded

b. Prior to commencement of work:

- Notice of EEO Commitment

c. During the construction period:

- Monthly Employment Utilization Report (form CC257)

6. SURVEY OPERATIONS:

The Contractor shall be responsible for all survey and layout operations and shall be responsible for the following:

a. Locate elevations of all improvements, establish control points and bench marks adequate for the use of all trades so that all parts of the work are within the specified and indicated tolerances.

b. As the work proceeds, verify all grades, lines, and dimensions indicated on the drawings, and report errors and inconsistencies to the Architect in writing. Do not proceed until errors and inconsistencies are corrected.

c. Maintain staking as required by construction progress and maintain construction progress and maintain control points and benchmarks until final completion of the project.

7. INSURANCE COVERAGE REQUIREMENTS—TYPES AND LIMITS:

A. Builders Risk Course of Construction Insurance:

1. Replacement value of County-furnished materials and equipment for this Project is valued at $ 12,000,000.

2. If new Work involves a major addition/renovation that could affect the structural integrity of the existing structure, Contractor shall insure the new Work and the existing structure for the total cost of the Contract plus the value of the existing structure.

B. Automobile Liability Insurance:

Minimum coverage requirements shall provide a limit of not less than $2,000,000 per accident.

C. Workers Compensation and Employers Liability Insurance: Such coverage shall provide workers compensation benefits, as required by the Labor Code of the State of California. Such policy shall be endorsed to waive subrogation against the County for injury to the Contractor's employees. If the Contractor's employees will be engaged in maritime employment, the coverage shall provide the benefits required by the U.S. Longshore and Harbor Workers Compensation Act, Jones Act, or any other Federal law to which the Contractor is subject.

1. In all cases, the above insurance shall include Employers Liability coverage with limits not less than:

i.	Each accident:	$1 million
ii.	Disease – policy limit:	$1 million
iii.	Disease – each employee:	$1 million

8. CERTIFICATE OF INSURANCE:

a. Refer to General Conditions, Articles 43, 44, and 45, regarding insurance.

b. Certificate of Insurance shall include the following statement:

"It is further understood and agreed that these insurance policies comply with the Contract requirements of this project."

c. The cancellation clause shall be modified to read as follows:

"Should any of the above-described policies be canceled before the expiration date thereof, the issuing company will mail 30 days written notice to the below-named certificate holder.

d. The Certificate of Insurance shall clearly state that the County of Los Angeles and its Special Districts are named as Additional Insured.

e. Include the name of the project and specification number on all insurance certificates.

9. CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT:

The Contractor shall comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act of 1970 (42 U.S.C. 1857 et seq.) and the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) as amended. Violations shall be reported to the County and the Regional Office of the Environmental Protection Agency.

10. LOBBYING OF COUNTY OFFICIALS:

Contractor and each County lobbyist or County lobbying firm as defined in Los Angeles County Code Section 2.160.010, retained by Contractor, shall fully comply with the County Lobbyist Ordinance, Los Angeles County Code Chapter 2.160. Failure on the part of Contractor or any County lobbyist or County lobbying firm retained by Contractor to fully comply with the County Lobbyist Ordinance shall constitute a material breach of this Contract upon which County may immediately terminate or suspend this Contract.

11. CORRESPONDENCE:

All correspondence shall be addressed to the County of Los Angeles, Department of Public Works, P.O. Box 1460, Alhambra, California 91802-1460, Attention: Project Management Division. This address shall be included in all contracts with subcontractors and suppliers.

12. EMPLOYMENT OF LAID-OFF COUNTY EMPLOYEES - SKILLED TRADES AND OTHERS:

a. Should Contractor, or any Subcontractor performing more than $250,000 of the Contract value, require additional or replacement personnel to perform services under this Contract, other than the performance of a skilled trade, Contractor shall give first consideration for such employment openings to qualified former County employees who are on a re-employment list.

b. Should Contractor, or any Subcontractor performing more than $250,000 of the Contract value, require additional or replacement personnel to perform a skilled trade not covered by an existing union hiring agreement under this Contract, Contractor is encouraged to consider for such employment openings qualified County employees who are targeted for layoff or qualified former County employees who are on a re-employment list. In no event shall the County be liable for any cost, delay, or impact claims arising out of efforts to hire such present and former County employees.

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10/2009

SECTION 00 09 12

COUNTYWIDE LOCAL AND TARGETED WORKER HIRE PROGRAM - MANDATORY

PART 1 – GENERAL

1.01 SUMMARY

This Section 00 09 12 includes:

Part 1 – General
1.01 – Summary
1.02 – Definitions
1.03 – Local and Targeted Worker Hire Program (LTWHP)

Part 2 – Administration
2.01 – Administration & Compliance
2.02 – Jobs Coordinator Minimum Qualifications
2.03 – Responsibilities of the Jobs Coordinator
2.04 – Community Service Providers

Part 3 – Forms
3.01 – Form 00 09 12-A: LTWHP Craft Employee Request Form
3.02 – Form 00 09 12-B: LTWHP Workforce Utilization Plan
3.03 – Form 00 09 12-C: FPL List of Zip Codes
3.04 – Form 00 09 12-D: Local and Targeted Worker Hire Status Report
3.05 – Form 00 09 12-E: Approved Jobs Coordinators List

1.01 **MANDATORY HIRING GOALS FOR THIS PROJECT**

The County of Los Angeles has implemented a Local and Targeted Worker Hire Policy (LTWHP) to facilitate the hiring of Local and Targeted workers. Pursuant to this policy, this project has a ***mandatory goal*** of at least 30 percent of total California Construction Labor Hours worked be performed by a qualified Local Resident and at least 10 percent of total California Construction Labor Hours worked on this project shall be performed by County residents classified as a Targeted Worker. Hours worked by a Targeted Worker who is also a Local Resident may be applied towards both the mandatory 30 percent Local Hire and 10 percent Targeted Worker Hire goals.

Including, a minimum ratio of one apprentice hour for every five journeyman hours shall be enforced, per State Labor code requirement, and the Contractor will strive to obtain half of all apprentice hours on the project be performed by Local and Targeted Workers. In addition, there shall be a **mandatory** requirement to use a Jobs Coordinator to be hired directly by the Contractor, prior to the start of work on the project. The Jobs Coordinator is an independent third-party individual, entity, or employee with whom the Contractor enters into a contract or employs to facilitate the implementation of the Local and Targeted

Worker Hiring Requirements of this Agreement. The Jobs Coordinator may be selected from the approved Jobs Coordinators list available as Form 00 09 12-E. If the Contractor utilizes an employee as a Jobs Coordinator, the Jobs Coordinator must be able to demonstrate or document to the County the minimum qualifications and/or experience to fulfill the duties and responsibilities as outlined in Sections 2.02 and 2.03.

1.02 DEFINITIONS

Terms used in the implementation of the LTWHP shall be defined as follows:

A. **California Construction Labor Hours –** Includes all craft worker hours performed on the project by California residents, excluding the hours performed by off-site material fabricators, designers, project office staff, or vendors.

B. **Certified Payroll Reports** – The Contractor shall comply with the requirements of Section 1776 of the Labor Code, State of California for the submission of Certified Payroll Reports (CPR). The Contractor and its subcontractors shall submit a copy of all CPR's to the County on a monthly basis, no later than on the first Monday of the subsequent month. Contractor and its subcontractors shall submit all CPR's to the County electronically if an online system is designated by the County**.**

C. **Community Service Providers –** A network of public and private partners working to support workers and businesses by serving their employment and training needs. These providers include local one-stop job/career centers funded by the Federal Workforce Innovation and Opportunities Act (WIOA). These centers help businesses find skilled workers and connect customers to work related training and education; most services are available at no cost. Examples of Community Service Providers are listed in Section 2.04.

D. **Craft Employee Request Form –** The form used by the Contractor and its subcontractors to request dispatch of craft workers (including, but not limited to, apprentices and journeymen), who are Local Residents or Targeted Workers, from a Community Service Provider or union hiring hall in the event that assistance in obtaining such workers is needed. The request form is submitted by the Contractor/subcontractors, completed and executed by the Community Service Provider or union hiring hall, and a copy retained by the Contractor for auditing purposes.

E. **Jobs Coordinator** – An individual or firm that facilitates implementation of the Targeted Worker hiring requirements of the County of Los Angeles for the Contractor/subcontractors. The Jobs Coordinator must be able to demonstrate or document to the County the requisite qualifications and/or experience to fulfill the duties and responsibilities as outlined in Section 2.02 and 2.03.

F. **Local and Targeted Worker Hire Status Report** – A monthly report required to be submitted to the County as listed on Form 00 09 12-D.

G. **Local Resident** – A Local Resident is defined as an individual whose primary place of residence is within the Tier 1 or Tier 2 ZIP Codes of the County, as listed in Forms 00 09 12-A and 00 09 12-C.

H. **Workforce Utilization Plan** – Form 00 09 12-B submitted by the Contractor on behalf of itself and its subcontractors prior to commencing work, specifying a Workforce Utilization Plan, which contains the workforce plan and schedule for the hiring of qualified Local Residents and Targeted Workers, including the use of the subcontractors' workforce to meet the LTWHP hiring goal. The Contractor shall submit updates of the Workforce Utilization Plan to reflect changes in project conditions, schedules, or subcontractors.

I. **Targeted Worker** - A Targeted Worker is an individual who is a County resident and faces at least one or more of the following barriers to employment:

1. Has a documented annual income at or below 100 percent of the Federal Poverty Level;
2. No high school diploma or GED;
3. A history of involvement with the criminal justice system;
4. Protracted unemployment (receiving unemployment benefits for at least 6 months);
5. Is a current recipient of government cash or food assistance benefits;
6. Is homeless or has been homeless within the last year;
7. Is a custodial single parent;
8. Is a former foster youth; or
9. Is a veteran, or is the eligible spouse of a veteran of the United States armed forces, under Section 2(a) of the Jobs for Veterans Act (38 U.S.C.4215[a]).
10. Eligible Migrant and seasonal farmworkers
11. English Language Learners
12. Older Individuals (55+)
13. Disabled
14. Individuals with Low levels of Literacy
15. Multi-Craft Core Curriculum (MC3) program graduates.

J. **Tier 1 Zip Codes** – Tier 1 ZIP Codes are those Zip codes listed in Form 00 09 12-A.

K. **Tier 2 Zip Codes** – Tier 2 ZIP Codes are those Zip codes listed in Form 00 09 12-C.

1.03 **LOCAL AND TARGETED WORKER HIRE PROGRAM**

A. The Contractor and its subcontractors shall meet the following minimum mandatory Local Resident and Target Worker hiring requirements:

1. At least 30 percent of total California Construction Labor Hours worked on the project must be performed by a qualified Local Resident;
2. And at least 10 percent of total California Construction Labor Hours worked on the project shall be performed by a Targeted Worker. The hours worked by a Targeted Worker who is also a Local Resident may also be applied towards the 30 percent Local Resident hiring goal.
3. A minimum ratio of one apprentice hour for every five journeyman hours shall be enforced, per State Labor code requirement, and the Contractor will strive to obtain half of all apprentice hours on the project be performed by Local and Targeted Workers.
4. In addition, there shall be a mandatory requirement to use a Jobs Coordinator, as that term is defined in Section 1.02, to facilitate implementation of the Targeted hiring requirements of this Policy; and the Contractor shall ensure the mandatory hiring requirements provided for Local and Targeted Workers are met in accordance with this Policy.

B. The available pool of Local Residents whose primary place of residence is within Tier 1 ZIP Codes (listed under Form 00 09 12-A), must first be exhausted in the manner specified in Section 2.01G before employing worker(s) from Tier 2 ZIP Codes (listed under Form 00 09 12-C).

C. All California Construction Labor Hours shall be included in the calculation for the percentage requirements set forth in Section 1.03 A.

D. The Contractor and its subcontractors shall not discriminate against or give preference to any particular individual or group based on race, color, gender, sexual orientation, age or disability.

PART 2 – ADMINISTRATION

2.01 ADMINISTRATION & COMPLIANCE

A. Prior to start of work on the project, the Contractor shall perform the following:

1. The Contractor shall hire a Jobs Coordinator for the project in accordance with Section 2.02.
2. The Contractor and all subcontractors of every tier shall coordinate with the Jobs Coordinator for services to support their efforts in meeting the targeted hiring percentages as described in Section 1.01 of this Specification.

B. The Contractor and its subcontractors shall use the Craft Employee Request Form (Form 00 09 12-A) for all requests for dispatch of qualified Local Residents and Targeted craft workers (including apprentices and journeymen) in the event that

assistance in obtaining such workers is needed from a Community Service Provider, union hiring hall, or other source.

C. Prior to commencing work, the Contractor, on behalf of itself and its subcontractors, shall submit a Workforce Utilization Plan (Form 00 09 12-B) to the County Project Manager that contains the workforce hiring plan and schedule for the hiring of qualified Local and Targeted Workers and the assignment and use of the subcontractors' workforce to meet the Local Worker Hiring requirement. The Contractor, thereafter, shall submit updates of the Workforce Utilization Plan to reflect changes in project conditions, schedule, or subcontractors.

D. No later than the 15th calendar day of each month, the Contractor shall submit to the designated County representative a completed Local and Targeted Hire Status Report containing the relevant information for the preceding month. The Local and Targeted Hire Status Report shall contain, at a minimum, the information specified below for Contractor and its subcontractors:

1. For each California Project Craft Worker (apprentices and journeymen): (a) the total labor hours, total number of all workers (apprentices and journeymen), hours worked on the project; and (b) the wages earned on the project.
2. Total number of Local Residents (apprentices and journeymen), hours worked (apprentices and journeymen), segregated by Tier 1 and Tier 2 Residency Preference Areas, and wages earned by each Local Resident.
3. Total number of Targeted Worker hours worked (apprentices and journeymen by Tier 1 and Tier 2 Residency Preference Areas) and Targeted worker data and workers demographic profile.
4. Total number of hours worked by Local Residents by subcontractor.

E. No later than the 15th calendar day of each month, the Contractor and all its subcontractors shall submit the Local and Targeted Hire Status Report to the designated County representative (or submit the data online if the County elects to provide an online system), to demonstrate progress in meeting the Workforce Utilization Plan. Failure to submit the Local and Targeted Worker Hire Status Report to the designated County representative shall be deemed to constitute zero percent local hire participation for the month and the County may retain the Monthly Mandatory Compliance Withholding (MMCW) amount.

F. The County may, in its sole discretion, elect to provide an online system for the Contractor and all of its subcontractors to input the data required in the Local and Targeted Worker Hire Status Report. If the County so elects, the Contractor and subcontractors shall utilize that online system in lieu of completing and submitting the Local and Targeted Worker Hire Status Report.

G. The Contractor and its subcontractors shall <u>first</u> meet the Local and Targeted Worker Hire participation requirement by employing qualified workers from the Tier 1 Preference Area. If the Contractor is unable to meet their entire Local and Targeted Worker Hire need from this area, it must submit to the Project Manager a statement certifying that it has exhausted all available qualified Local and Targeted Workers

from this area during a 48-hour period before pursuing workforce from the Tier 2 Preference Area.

H. The Contractor's compliance with the approved Workforce Utilization Plan will be evaluated monthly using the Local and Targeted Hire Status Report.

I. To enforce compliance on contracts containing mandatory hiring goals, an amount will be withheld from the monthly progress payment to the Contractor in proportion to the deficit percentage of the mandated Local and Targeted Hiring Goal percentage and the actual percentage obtained. The maximum that may be withheld during the duration of the project is one percent of the total construction contract amount, but not to exceed $500,000, comprised of 0.75 percent for Local Worker goal compliance, and 0.25 percent for Targeted Worker goal compliance. This amount is called the Monthly Mandatory Compliance Withholding (MMCW) amount. The percentage of the MMCW that will be withheld for a given month will be the same as the percentage of the deficit in achieving the LTWHP targets for that month.

The maximum MMCW amount is determined as follows:

Construction Contract Value X .75% ÷ Number of months in baseline construction schedule = MMCW for Local Workers

Construction Contract Value X .25% ÷ Number of months in baseline construction schedule = MMCW for Targeted Workers

J. If the Targeted Worker Hiring mandatory requirements of the Policy have not been satisfied as required for a project, the Contractor nonetheless may be deemed to be in compliance if the Contractor demonstrates both (a) that the Contractor and each of its subcontractors have complied with all other requirements of the Policy, and (b) that the Contractor and each of its subcontractors have satisfactorily demonstrated the following:

Documented contact with the Department of Workforce Development, Aging and Community Services, America Job Centers or with an agency that supports and provides employment and training services for Targeted Workers in construction employment, and in which instance the agency did not refer a qualified Targeted Worker to the Contractors or subcontractor within 48 hours of the job request for fair consideration of the Targeted Worker.

K. At the conclusion of the project, the County will conduct a final evaluation of the Contractor's compliance with the Workforce Utilization Plan as described in Section 2.01.C and execute a final release of funds, if applicable, as described in Section 2.01.I. The Contractor's failure to meet the Local and Targeted Worker Hiring Requirement in Section 1.01 by the conclusion of the project shall result in the County imposing liquidated damages and deducting such amount otherwise owed to the Contractor in its final payment. The County will not be required to pay interest on any amounts withheld during the term of the contract.

L. The County and Contractor specifically agree that the MMCW amount, minus the total value of previous releases, in direct proportion to the actual Local and Targeted hire participation levels achieved by the Contractor consistent with the Workforce Utilization Plan, shall be imposed as liquidated damages, and not as a forfeiture or penalty. It is further specifically agreed that the aforesaid amount is presumed to be the amount of damages sustained due to the Contractor's inability to achieve the Local and Targeted Worker Hiring Requirement in Section 1.01.

M. For construction contracts where the work is performed for a private County Lessee, the Lessee shall be responsible for administration of all aspects of this Section 2.01, including the calculation and collection of the Local Hire Participation Compliance Rectification Amount. At the conclusion of the project, the Lessee shall pay over the designated County representative any such amounts collected and shall provide a full report to the designated County Representative of all monthly information required to be collected in this Section 2.01.

2.02 JOBS COORDINATOR MINIMUM QUALIFICATIONS

A. If the Jobs Coordinator is selected from the approved list provided on Form 00 09 12-E, that Jobs Coordinator shall be deemed to meet the minimum qualifications. No additional qualification information need be provided.

B. If the Contractor desires to utilize a Jobs Coordinator not listed on Form 00 09 12-E (*i.e.*, a Contractor employee or other non-listed firm), the Contractor must be able to demonstrate that the selected Jobs Coordinator meets the minimum qualifications listed in this Section 2.02. When requested by the County, the Contractor shall provide documentation sufficient to satisfy the County, in the County's sole discretion, that the selected Jobs Coordinator meets the minimum qualifications listed in this Section 2.02.

C. A minimum of 3 years' experience as providing Jobs Coordinator services. Successful candidates for Jobs Coordinators must be able to demonstrate the in-depth ability, experience, and possess the necessary staff capable of providing required services.

D. A successful Jobs Coordinator must demonstrate they possess working relationships with the Building Trades, Targeted Workers and signatory craft councils and unions operating within County of Los Angeles' jurisdiction by describing previous interactions, relationships, and partnerships with these party's/groups.

E. A successful Jobs Coordinator must be able to demonstrate that it has experience on projects similar in scale to the current project.

F. A successful Jobs Coordinator must demonstrate that they possess experience with Targeted Worker populations.

G. A successful Jobs Coordinator must have experience in working with work-source centers, faith-based organizations and other Community Based Organizations (CBOs).

H. A successful Jobs Coordinator must be familiar with incentive programs and tax credit subsidies provided by the State and Federal government to hire workers that fit the corresponding category. Jobs Coordinator to describe their experience in working with these programs

2.03 RESPONSIBILITIES OF THE JOBS COORDINATOR

The Contractor shall ensure that the selected Jobs Coordinator effectively performs the following duties:

A. The Jobs Coordinator shall develop, create, design and market specific programs to attract Targeted Workers for construction opportunities (e.g. handouts and fliers for “walk-ins” demonstrating program entrance procedures).

B. The Jobs Coordinator shall coordinate services for Contractor to use in the recruitment of Targeted Workers.

C. The Jobs Coordinator shall educate and assist Contractor on incentives provided by state or federal programs for on-the-job training and employer tax credits.

D. The Jobs Coordinator shall conduct orientations, job fairs and community outreach meetings in the local community.

E. The Jobs Coordinator shall screen and certify the Targeted Workers status.

F. The Jobs Coordinator shall establish a referral and retention tracking mechanism for placed Targeted workers and apprentices.

G. The Jobs Coordinator shall network with the various work source centers, community and faith-based organizations and other non-profit entities that provide qualified Local and/or Targeted Workers.

H. The Jobs Coordinator shall coordinate with the various building trades crafts for referral and placement of Targeted Workers.

I. The Jobs Coordinator shall maintain a database of pre-qualified Targeted Workers for referral.

J. The Jobs Coordinator shall be the point of contact to provide information about available job opportunities on projects.

K. The Jobs Coordinator shall assist the subcontractors with their documentation effort and other reports as it relates to their Targeted Worker hiring requirements.

L. The Jobs Coordinator shall work closely with County staff, the Building Trades, and subcontractors in achieving the Targeted hiring goals.

2.04 COMMUNITY SERVICE PROVIDERS

Examples of Community Service Providers that may be used by Contractor and subcontractors to identify Local Residents and Targeted Workers include:

- Los Angeles County Workforce Development, Aging, and Community Services: http://wdacs.lacounty.gov/
- LA Jobs: https://www.jobsla.org/vosnet/Default.aspx
- Cal Jobs: http://www.caljobs.ca.gov/vosnet/Default.aspx
- Helmets to Hardhats: https://www.helmetstohardhats.org
- America's Job Center of California: http://www.americasjobcenter.ca.gov/

PART 3 – FORMS

Form 00 09 12-A: LTWHP Craft Employee Request Form

Form 00 09 12-B: LTWHP Workforce Utilization Plan for Pathway Torrance Community Health and Wellness Center Renovation Project

Form 00 09 12-C: FPL List of Zip Codes

Form 00 09 12-D: Local and Targeted Worker Hire Status Report

Form 00 09 12-E: Approved Jobs Coordinators List

COUNTYWIDE CWA - PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT

The County of Los Angeles Countywide Community Workforce Agreement applies to this project. This project shall include a *mandatory* hiring goal of at least 30% California Construction Labor Hours performed by either Tier 1 or Tier 2 Qualified Local Residents and at least 10% of California Construction Labor Hours on the project performed by those classified as a Targeted Worker. California Construction Labor Hours is defined as all craft worker hours performed on the project by California residents, excluding the hours performed off site metal fabricators, designers, project office staff, or vendors. Hours worked by a Targeted Worker who is also a Tier 1 or Tier 2 Qualified Local Resident may be applied towards the 30% goal.

C O N T R A C T O R U S E O N L Y

Please complete and fax or email this form to the applicable union to request craft workers that fulfill the hiring requirements for this project. After faxing this request, call the Local Union to verify receipt and substantiate their capacity to furnish workers as specified below. Please print Fax or Email Transmission Verification Reports and keep copies as records.

TO:	Local Union #:	**CC:**	County Project Labor Coordinator:
	Email/Fax:		Email/Fax:
FROM:	Contractor:		
	Issued by:		
	Email/Phone/Fax:		

UNION CRAFT WORKER REQUEST:

Craft Classification	Journeyman or Apprentice	Tier 1 or Tier 2 Worker	Targeted Worker	No. of Workers Requested
	☐ JM ☐APP	*	**	
	☐ JM ☐APP	*	**	
	☐ JM ☐APP	*	**	
			Total Number of Workers Requested:	

<u>In accordance with the CWA, Article 7, Referral, County and Contractor are requesting the Union:</u>

* Provide workers from Tier 1. If the supply of available Tier 1 workers has been exhausted, please provide workers from Tier 2, if available.

** Provide targeted workers, if available.

WORKER REPORTING INSTRUCTIONS:

Reporting Date/Time	
Project Location:	
Reporting To:	
On Site Phone:	
Special Instructions:	

U N I O N U S E O N L Y

Please complete the "Union Use Only" section and fax or email both pages to the requesting Contractor and Project Labor Coordinator.

Dispatch Received by & Date:	

Date Worker(s) Dispatched:						
Name	**Helmets to Hardhats**	**Journeyman or Apprentice**	**Tier 1 or Tier 2 Worker?**	**Zip Code**	**Targeted Worker?**	**Targeted Category ** if known**
	☐ Y ☐ N	☐ JM ☐ APP	☐ Tier 1 ☐ Tier 2 ☐ No*		☐ Y ☐ N	
	☐ Y ☐ N	☐ JM ☐ APP	☐ Tier 1 ☐ Tier 2 ☐ No*		☐ Y ☐ N	
	☐ Y ☐ N	☐ JM ☐ APP	☐ Tier 1 ☐ Tier 2 ☐ No*		☐ Y ☐ N	

* No: By selecting "No" for the "Tier 1 or Tier 2 Worker" certifies, on behalf of the Union, that the Union has exhausted all reasonable efforts to locate and dispatch such Tier 1 or Tier 2 worker.

** Please indicate number of the Targeted Worker category (1 through 15, as shown on page 2). Indicate multiple categories per worker, if applicable.

COUNTYWIDE CWA - PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT

QUALIFYING ZIP CODES - Below are ALL Tier 1 and Tier 2 Qualifying Zip Codes.
Tier 1 Zip Codes are shaded.

Note: Tier 1 Zip Codes must be exhausted first before moving into Tier 2 Zip Codes.

90001	90002	90003	90004	90005	90006	90007	90008	90010	90011
90012	90014	90015	90016	90017	90018	90019	90020	90021	90022
90023	90026	90028	90029	90031	90032	90033	90034	90035	90036
90037	90038	90040	90042	90043	90044	90047	90057	90058	90059
90061	90062	90063	90089	90201	90220	90221	90222	90242	90247
90250	90255	90262	90270	90280	90301	90302	90303	90304	90401
90501	90601	90602	90640	90706	90716	90723	90731	90744	90802
90804	90805	90806	90810	90813	91001	91046	91103	91201	91203
91204	91205	91303	91331	91335	91340	91342	91343	91352	91401
91402	91405	91406	91411	91502	91601	91605	91606	91702	91706
91731	91732	91733	91744	91746	91754	91755	91766	91767	91768
91770	91776	91803	93243	93534	93535	93543	93550	93552	93553
93560	93591	X	X	X	X	X	X	X	X

** A **Targeted Worker** is an individual who is *both* a County resident and who faces **one or more** of the following barriers to employment:

1. Has a documented annual income at or below 100% of the Federal Poverty Level
2. Has no high school diploma or GED
3. Has a history of involvement with the criminal justice system
4. Is experiencing protracted unemployment (receiving unemployment benefits for at least 6 months)
5. Is a current recipient of government cash or food assistance benefits
6. Is homeless or has been homeless within the last year
7. Is a custodial single parent
8. Is a former foster youth
9. Is a veteran or is the eligible spouse of a veteran of the United States armed forces under Section 2(a) of the Jobs for Veterans Act (38 U.S.C.4215[a])
10. Is an eligible migrant and seasonal farm worker
11. Is currently an English language learner
12. Is an older individual (55+)
13. Is disabled
14. Is an individual with a low level of literacy
15. Is a Multi-Craft Core Curriculum (MC3) Program Graduate

[This form is not intended to replace a Union's Dispatch or Referral Form normally given to the employee when being dispatched to the jobsite.]

Contractor: **All Contractors**

Workforce Utilization Plan / Projection Hours

Project Name: **Pathway Torrance Community Health and Wellness Center Renovation Project** **Date:** _____

Project Duration: 0 Calendar Days

	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	**Total**
PROJECTED PROJECT HOURS														
Local Hours (Tier 1)	50	0	0	0	0	0	0	0	0	0	0	0	0	50
Local Hours (Tier 2)	100	0	0	0	0	0	0	0	0	0	0	0	0	100
Total Project Hours	500	0	0	0	0	0	0	0	0	0	0	0	0	500
Total Local Hours (%)	30%													30%
Targeted Worker Hours	50	0	0	0	0	0	0	0	0	0	0	0	0	50
Targeted Worker Hours (%)	10%													10%
ACTUAL PROJECT HOURS														
Local Hours (Tier 1)	75	0	0	0	0	0	0	0	0	0	0	0	0	75
Local Hours (Tier 2)	100	0	0	0	0	0	0	0	0	0	0	0	0	100
Total Project Hours	500	0	0	0	0	0	0	0	0	0	0	0	0	500
Total Local Hours (%)	35%													35%
Targeted Worker Hours	50	0	0	0	0	0	0	0	0	0	0	0	0	50
Targeted Worker Hours (%)	10%													10%

COUNTY OF LOS ANGELES
LOCAL AND TARGETED WORKER HIRE POLICY
QUALIFYING ZIP CODES

Tier 1, 2 and Qualifying Zip Codes are defined as:

Tier 1 Zip Code: A Tier 1 Qualified Local Resident is defined as a County resident whose primary residency is: (1) within five (5) miles of the proposed project site; and (2) is within a Qualifying Zip Code. If a qualifying Zip Code is partially located within the 5-mile radius, then the entire Zip Code is considered as a Tier I Zip Code, and workers living in that entire Zip Code area may qualify as Tier I hiring.

Tier 2 Zip Code: A Tier 2 Qualified Local Resident is defined as a County resident whose primary residency is: (1) within a Qualifying Zip code; and (2) that Qualifying Zip Code is beyond five (5) miles of the proposed project site.

Qualifying Zip Code: A Qualifying Zip Code is defined as a zip code within the County of Los Angeles, where either: (1) the average percentage of households living below 200 percent of the Federal Poverty Level (FPL) for that individual's primary residency's Zip Code is greater than the County average for such households; or (2) the Zip Code is one of 11 additional Zip Codes determined by the Board on September 6, 2011 to be a Zip Code where at least 30 percent of the population is living in poverty, and with an unemployment rate of at least 150 percent of the national average.

Zip Code	Region	SD1	SD2	SD3	SD4	SD5
90001	Florence / South Central (City of LA)		X		X	
90002	Watts (City of LA)		X		X	
90003	South Central (City of LA)		X			
90004	Hancock Park (City of LA)	X	X	X		
90005	Koreatown (City of LA)		X			
90006	Pico Heights (City of LA)	X	X			
90007	South Central (City of LA)	X	X			
90008	Baldwin Hills / Crenshaw (City of LA) / Leimert Park (City of LA)		X			
90010	Wilshire Blvd (City of LA)		X			
90011	South Central (City of LA)	X	X			
90012	Civic Center (City of LA) / Chinatown (City of LA)	X				
90014	Los Angeles	X				
90015	Downtown Los Angeles (City of LA)	X	X			
90016	West Adams (City of LA)		X			
90017	Los Angeles	X				
90018	Jefferson Park (City of LA)		X			
90019	Country Club Park (City of LA) / Mid City (City of LA)		X			
90020	Hancock Park (City of LA)		X			
90021	Downtown Los Angeles (City of LA)	X				
90022	East Los Angeles	X			X	
90023	East Los Angeles (City of LA)	X			X	
90026	Echo Park / Silverlake (City of LA)	X				
90028	Hollywood (City of LA)			X		X
90029	Downtown Los Angeles (City of LA)	X		X		
90031	Montecito Heights (City of LA)	X				
90032	El Sereno (City of LA) / Monterey Hills (City of LA)	X				
90033	Boyle Heights (City of LA)	X				
90034	Palms (City of LA)		X	X		
90035	West Fairfax (City of LA)		X	X		
90036	Park La Brea (City of LA)		X	X		
90037	South Central (City of LA)		X			
90038	Hollywood (City of LA)			X		
90040	Commerce, City of	X			X	

COUNTY OF LOS ANGELES
LOCAL AND TARGETED WORKER HIRE POLICY
QUALIFYING ZIP CODES

Zip Code	Region	SD1	SD2	SD3	SD4	SD5
90042	Highland Park (City of LA)	X				
90043	Hyde Park (City of LA) / View Park / Windsor Hills		X			
90044	Athens		X			
90047	South Central (City of LA)		X			
90057	Westlake (City of LA)	X				
90058	Vernon	X	X		X	
90059	Watts (City of LA) / Willowbrook		X		X	
90061	South Central (City of LA)		X			
90062	South Central (City of LA)		X			
90063	City Terrace	X				
90089	Exposition Park(City of LA)		X			
90201	Bell / Bell Gardens / Cudahy				X	
90220	Compton / Rancho Dominguez		X			
90221	East Rancho Dominguez		X		X	
90222	Compton / Rosewood / Willowbrook		X		X	
90242	Downey				X	
90247	Gardena		X			
90250	Hawthorne (Holly Park) / Lawndale (Federal Bldg)		X			
90255	Huntington Park / Walnut Park		X		X	
90262	Lynwood				X	
90270	Maywood				X	
90280	South Gate		X		X	
90301	Inglewood		X			
90302	Inglewood		X			
90303	Inglewood		X			
90304	Lennox		X			
90401	Santa Monica			X		
90501	Torrance		X		X	
90601	Whittier	X			X	
90602	Whittier	X			X	
90640	Montebello	X			X	
90706	Bellflower				X	
90716	Hawaiian Gardens				X	
90723	Paramount				X	
90731	San Pedro (City of LA) / Terminal Island (City of LA)				X	
90744	Wilmington (City of LA)		X		X	
90802	Long Beach				X	
90804	Long Beach				X	
90805	North Long Beach (Long Beach)		X		X	
90806	Long Beach				X	
90810	Carson / Long Beach		X		X	
90813	Long Beach				X	
91001	Altadena					X
91046	City of Glendale					X
91103	Pasadena					X
91201	Glendale					X
91203	Glendale					X
91204	Glendale (Tropico)					X
91205	Glendale (Tropico)					X
91303	Canoga Park (City of LA)			X		
91331	Arleta (City of LA) / Pacoima (City of LA)			X		X
91335	Reseda (City of LA)			X		

91340	San Fernando			X		
91342	Lake View Terrace (City of LA) / Sylmar (City of LA)			X		X
91343	North Hills (City of LA)			X		
91352	Sun Valley (City of LA)			X		X

COUNTY OF LOS ANGELES
LOCAL AND TARGETED WORKER HIRE POLICY
QUALIFYING ZIP CODES

Zip Code	Region	SD1	SD2	SD3	SD4	SD5
91401	Van Nuys (City of LA)			X		
91402	Panorama City (City of LA)			X		
91405	Van Nuys (City of LA)			X		
91406	Van Nuys (City of LA)			X		
91411	Van Nuys (City of LA)			X		
91502	Burbank					X
91601	North Hollywood (City of LA)					X
91605	North Hollywood			X		X
91606	North Hollywood			X		X
91702	Angeles National Forest	X				X
91706	Baldwin Park / Irwindale	X				X
91731	El Monte	X				
91732	El Monte	X				
91733	South El Monte	X				
91744	Cityof Industry / La Puente / Valinda	X				
91746	Bassett / City of Industry / La Puente	X				
91754	Monterey Park	X				
91755	Monterey Park	X				
91766	Phillips Ranch / Pomoona / Chino	X				
91767	Pomona	X				X
91768	Pomona	X				
91770	Rosemead	X				X
91776	San Gabriel	X				X
91803	Alhambra	X				
93243	Lebec					X
93534	Lancaster					X
93535	Hi Vista					X
93543	Littlerock / Juniper Hills					X
93550	Palmdale / Lake Los Angeles / Sierra Madre					X
93552	Palmdale					X
93553	Littlerock / Juniper Hills / Pearblossom / Llano					X
93560	North Lancaster					X
93591	Palmdale/Lake Los Angeles					X

LOCAL AND TARGETED HIRE STATUS REPORT
LOS ANGELES COUNTY

Project: SAMPLE NAME
Supervisorial District: SD 4
Project Code: PW13950
Contractor(s): Multiple Contractors
Craft(s): Multiple Crafts
Construction Contract Amount: $0.00
Mandatory Local and Targeted Hiring Goal: 30.00%

From Date: 9/1/2016
To Date: 9/30/2016
Total Forecast Hours: 0.00
Total Project Hours to Date: 0.00
Total Hours Percent Complete: 10.00%

Area	Total Number of Workers Sep 01-Sep 30	% of Total Workers Sep 01-Sep 30	Total Hours Worked Sep 01-Sep 30	% of Total Hours Worked Sep 01-Sep 30	Cumulative Total Number of Workers	Cumulative % of Total Workers	Cumulative Total Hours Worked	% of Total Hours Worked	Cumulative Wages w/ Benefits	Cumulative Number of Foremen	Cumulative Foremen Hours	Cumulative Foreman Hours %	Cumulative Number of Journeymen	Cumulative Journeyman Hours	Cumulative Journeyman Hours %	Cumulative Number of Apprentices	Cumulative Apprentice Hours	Cumulative Apprentice Hours %
Tier 1	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Tier 2	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Other in LA County (non-local)	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Outside of LA County	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Employees Not In Specified Zip Lists	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Local and Targeted Workers																		
Local Resident (Tier 1 + Tier 2)	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Targeted Worker	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Demographic Profile																		
African American	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Asian	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Caucasian	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Hispanic	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Native American	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Not Specified	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Two Or More Races	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Other	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Male	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Female	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Veteran	0	0.00%	0.00	0.00%	0	0.00%	0.00	0.00%	$0.00	0	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%
Total Employees	0		0.00		0		0.00		$0.00	0	0.00		0	0.00		0	0.00	

SAMPLE

JOB COORDINATOR PANEL

as of December 2023

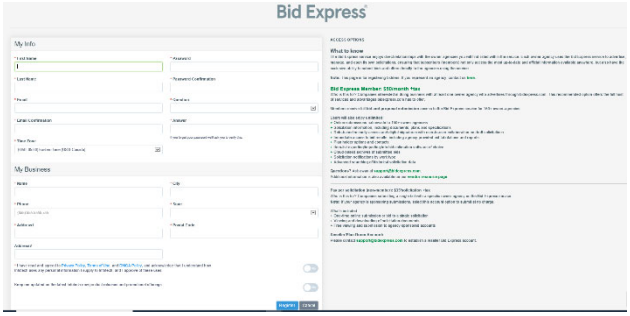
Casamar Group, LLC Joe Garcia 23335 Alamos Lane Newhall, CA 91321 TEL: 661.254-2373 Fax: 661.253.0549 jgarcia@casamargroup.com	**Del Richardson & Associates, Inc.** Del Richardson 510 S. La Brea Avenue Inglewood, CA 90301 TEL: 310.645.3729 ext. 229 FAX: 310.645.3355 Del.Richardson@drainc.com
Harris & Associates John W. Harris 865 S. Figueroa Street Los Angeles, CA 90017 TEL: 213.489.9833 FAX: 626.316.7103 john@jwharrislaw.com	**Managed Career Solutions, Inc.** Philip Starr 3333 Wilshire Blvd., Suite 405 Los Angeles, CA 90010 TEL: 213.355.5312 FAX: 213.381.5053 pstarr@mcscareergroup.com
Mindful Integration of Construction Services Theodora Oyie, MBA 5665 Wilshire Blvd. #1114 Los Angeles, CA 90036 TEL: 323. 383.9844 inclusion@mics.us	**Modern Times, Inc.** Joseph Hernandez 1892 E. Altadena Drive Altadena, CA 91001 TEL: 213.810.6105 FAX: 626.316.7103 joe@moderntimesinc.com
Onesimus, Inc Michael Richardson 129 E. 136th Street Los Angeles, CA 90061 TEL: 310.701.0359 profitableanduseful@gmail.com	**Pacific Resources Services Corporation** Ben Ocasio 11421 Lambert Ave. El Monte, CA 91732 TEL: 626.800.4006 FAX: 626.800.4140 bocasio@pacificresourcesservices.com
Padilla & Associates, Inc. Patricia Padilla 211 East City Place Drive Santa Ana, CA 92705 TEL: 714.225.0116 ppadilla@padillainc.com	**PDA Consulting, Inc.** Pamela Penn 8901 S. La Cienega Blvd. Suite 201 Inglewood, CA 90301 TEL: 310.910.0940 pamela.penn@pdaconsultinggroup.com
Playa Vista Job Opportunities and Business Services Mary Taylor 4112 S. Main Street Los Angeles, CA 90037 TEL: 323.432.3955 FAX: 323.432.3995 mtaylor@pvjobs.org	**TransCal Services, LLC** Jeffery Henderson 6109 S. Western Ave., Suite 308 Los Angeles, CA 90047 TEL: 323.305.6470 FAX: 323.305.6471 jhenderson@transcalservices.com
TSG Enterprises, Inc. dba The Solis Group Elizabeth Solis 131 N. El Molino Ave., Suite 100 Pasadena, CA 91101 TEL: 626.685.6989 FAX: 626.685.6985 elizabeths@thesolisgroup.com	**Power2Workers** Christiana Faulkner 5505 S. Vermont Ave. Los Angeles, CA 90037 TEL: 323.920.6674 christiana@power2workers.org

Infotech® Vendor Manager Account

Only one Infotech® account for each business is required to register for the Bid Express® (www.bidexpress.com) service. All other employees will then create accounts through an invitation sent by the manager.

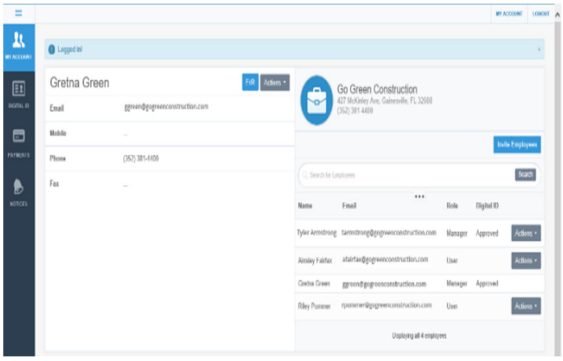
Whether you need to pay to bid on a solicitation depends on the agency. Some agencies sponsor solicitations for their vendors. A FREE tag will display for any solicitation not requiring a fee. Solicitations will either require an electronic signature or an Infotech Digital ID for bid submission. If the agency requires a Digital ID, you will be prompted to generate one. Do not pay for a solicitation or generate an ID until prompted to by a solicitation you select for bidding.

Register for a Manager Account



The first person to register for an Infotech account within a business is assigned managing access. As a manager, you can invite other employees to join the business account and change their roles. Your email address is your username for the account and to where Infotech services sends email notifications.

1. Navigate to www.bidexpress.com and click **Register** at the top right.
2. Fill out the registration form, and click the **Register** button. Your email address will be your username.
3. A message with a confirmation link will be sent to your email address. Click the Activate Account link within the email to activate your account.
4. Enter your password and click A**ctivate**.



Invite Employees

Invite employees to create a user account for your business. Emails will be sent to those invited. You will receive an email when the account has been created. Employees are assigned the role of user for the account.

1. Click **Invite Employees**. Enter one email address per line for each employee.
2. Click **Invite Employees**.

Change Employee Role

You will need to update the role of those employees you want to manage the account. You must also change each user's role within the Bid Express service itself. Please see the online help if you need assistance.

1. Click **Actions** for the employee and choose **Change Role**.
2. Select the manager role, and click **Change Role**.

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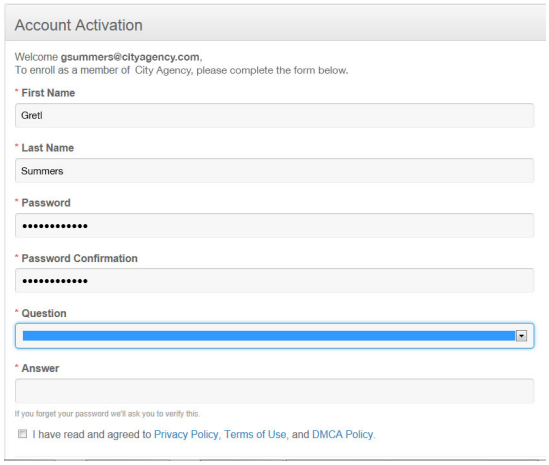
Infotech Vendor User Account

Only one Infotech account for each business is required to register for the Bid Express service at www.bidexpress.com. All employees of a business will then create user accounts through an invitation sent by the manager.



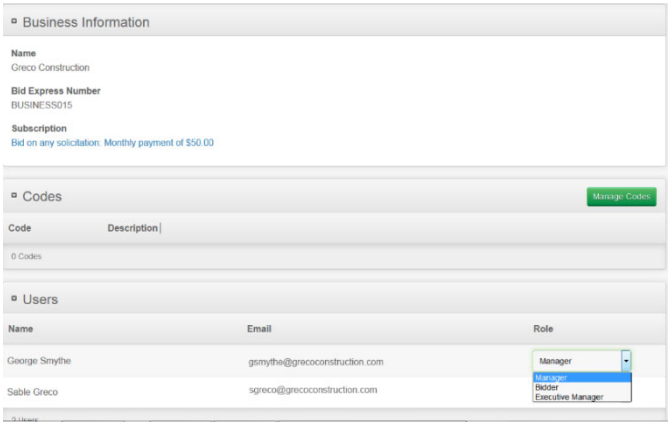
Register for a User Account

To join an existing business account, please ask a user of a manager account to send you an invitation. Once the invitation is sent, you'll receive an email to activate your account. Your email address is your username. Infotech services will send email notifications to this address.

Upon receipt of the email:

1. Select the **Create Account** link within the email.
2. Fill out the Account Activation form. Your email address will be your username.
3. Once the form is complete, click the **Activate** button.

The My Account page opens, displaying your account information and other employees within your company using Infotech services. You are automatically assigned a user role for the account and an Executive Manager read-only role for the Bid Express service. Any user with manager role can change your role.



Welcome to the Bid Express service

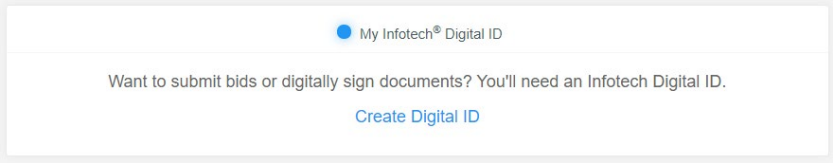
If you are planning on submitting bids, a user with a manager account for the Bid Express service must change your role within the Bid Express service itself. Please see the knowledge center if you need assistance.

Whether you need to pay to bid on a solicitation depends on the agency. Some agencies sponsor accounts for their vendors. A FREE tag will display for any solicitation not requiring a fee.

Solicitations will either require an electronic signature or an Infotech Digital ID for bid submission. If the agency requires a Digital ID, you will be prompted to generate one. Do not pay for a solicitation or generate an ID until prompted to by a solicitation you selected for bidding.

Understand and apply for Infotech® Multi-Browser Digital IDs

An Infotech® Digital ID confirms your identity as the authorized signer of your company and allows you to securely sign documents, such as bids or contracts, in an Infotech service.



Why do I need a Digital ID?

When you sign a document or submit a bid, we want to make sure you're you.

The authorized signer for your company must have a Digital ID created and approved before using any feature that requires a digital signature, such as advertising a solicitation, conducting a bid opening, submitting a bid in the Bid Express® service, or signing a contract document in the Doc Express® service.

The new Digital IDs can be used with any web browser, like Chrome or Edge.

The process

There are three parts to applying for a Digital ID.

- Application – apply for the ID
- Installation – after your identification has been verified, you'll install the ID
- Test – to make sure your ID works

ID application

Before you begin

- If you already have a Digital ID, delete the backup copy of your current Digital ID. You'll create a new backup as part of the ID installation process.
- You'll need access to your email in order to receive a verification code.
- You'll need a copy of the your driver's license, passport, or state ID in a file that can be uploaded.
- The phone number entered should be the applicant's phone number, not the person filling out the application (if it's not the applicant).

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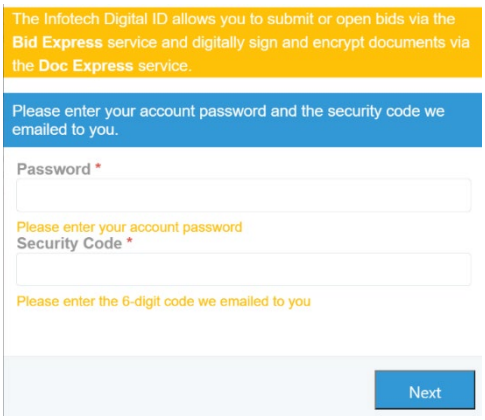
- An Infotech customer support representative will call the you, hopefully within one business day, to confirm their identification. It may take up to seven days.

Ready to apply for your Digital ID?



Go to your account pages by selecting **My Account** from the **three lines** in the upper left corner. Click **Digital ID** from the sidebar menu.

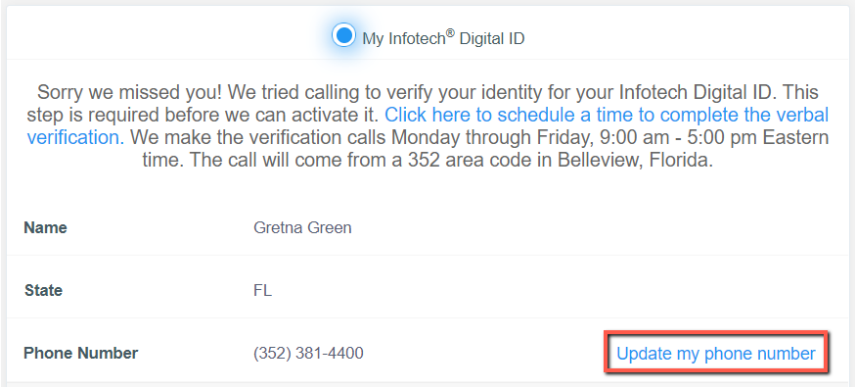
1. Click **Create Digital ID** to start the application.
2. Get the security code from your email and come back to the generate ID process.
3. Enter your account password and the code. Click **Next**.
4. Read the creation information and click **Next**.
5. Click **Attach Identification**. Navigate to and select the file containing the your ID and click **Open**.
6. Enter your name EXACTLY as it appears in the ID, including any punctuation marks or suffixes (like Jr.), and in legal order. Click **Next**.
7. Enter the contact phone number of the applicant.
8. Enter the state where the company headquarters are located. Click **Next**.
9. Review your business information. Confirm that the name of the person listed is the authorized signer for your company and your company name matches how you would like to submit bids to the agency. Click **Submit**.

A member of the customer support team will call you after the application is processed, hopefully within one business day, to confirm who you are. Once that happens, you'll get an email with instructions on installing your multi-browser Digital ID.

Need to change your phone number?

The phone number entered on the application should be the one of the applicant, not the phone number of the person entering the information (if they are different people).

1. Click the **Digital ID** tab from the My Account pages.
2. Select **Update my phone number**.
3. Enter the correct phone number in the New Phone Number field and click **Update**.



ID installation

Before you begin

- When installing the ID, log in to the Infotech service from the same device and use the same browser as when you created the ID.
- Create the backup ID when prompted and save it to an external media, such as a flash drive. You'll need it if you use a different computer or if you experience data loss. If you create the ID on a laptop using Chrome, you can't use it on a laptop using Edge or Desktop using Chrome unless you import it. The service will let you know if you have to import your ID.
- The service does not keep a copy of your ID file.
- If you haven't yet deleted the backup file of your old Digital ID, now's a good time to do it.

Ready to install your Digital ID?

Once your business information has been checked, you'll receive an email with a link to install your ID.

1. Click the link, or log in to your account. You can manage the installation of your Digital ID from the Digital ID tab of the My Account page.
2. Click **Install Digital ID**.
3. Create your backup ID by clicking **Back Up Your Digital ID**.
4. Click **Back Up**.

5. If you see a Save As window, navigate to the flash drive or other external media where you will save your backup Digital ID. If you don't see the window, your backup ID was saved in your Downloads folder. Copy the backup to the flash drive or other external media.

Test or import your Digital ID

Once you've applied for, installed, and made a backup copy of your multi-browser Digital ID, test it out to make sure there will be no problems when bidding. Use a different browser or computer and import your backup ID. If you can import it without any problems, your ID was successfully created.

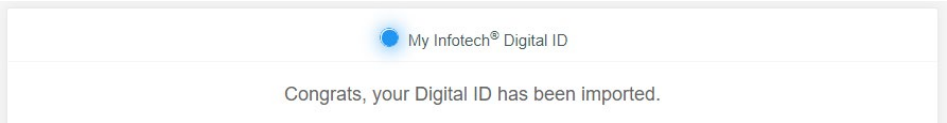
Before you begin

If you didn't backup your ID when it was installed, please do it now. Use the same computer and browser from when you created the Digital ID, and click **Back Up** on the Digital ID page. If you see a Save As window, navigate to the flash drive or other external media where you will save your backup Digital ID. If you don't see the window, your backup ID was saved in your Downloads folder. Copy the backup to the flash drive or other external media.

Ready to test or import your Digital ID?

1. Log in to the service using a different browser than the one where your Digital ID was created. For example, if you created the ID using Chrome, log in to the service using Edge.
2. Go to your account pages by selecting **My Account** from the **three lines** in the upper left corner. Click **Digital ID** from the sidebar menu.

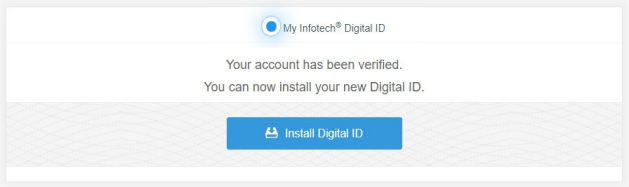
3. If you see a message that the service couldn't find your Digital ID, then you're using a good browser to test your ID. If you don't see the message, use a different browser.
4. Click **Import my Digital ID**.
5. Click **Select backup file**.
6. Navigate to and select your backup ID file. It will be named **FIRST LAST Digital ID.json**. Click **Open**.



If your ID didn't import, please contact customer support: support@bidexpress.com. A member of our customer support team will be happy to assist you.

Infotech® Multi-Browser Digital ID installation and backup

Once you've applied for an Infotech® multi-browser Digital ID and had your identity verified by a member of the Infotech customer support team, your ID will need to be installed before it can be used.



Before you begin

- When installing the ID, log in to the Infotech service from the same device and use the same browser as when you created the ID.
- Create the backup ID when prompted and save it to an external media, such as a flash drive. You'll need it if you use a different computer or if you experience data loss. If you create the ID on a laptop using Chrome, you can't use it on a laptop using Edge or Desktop using Chrome unless you import it. The service will let you know if you have to import your ID.
- The service does not keep a copy of your ID file.
- If you haven't yet deleted the backup file of your old Digital ID, now's a good time to do it.

Ready to install your Digital ID?

Once your business information has been checked, you'll receive an email with a link to install your ID.

1. Click the link, or log in to your account. You can manage the installation of your Digital ID from the Digital ID tab of the My Account page.
2. Click **Install Digital ID**.
3. Create your backup ID by clicking **Back Up Your Digital ID**.
4. Click **Back Up**.

5. If you see a Save As window, navigate to the flash drive or other external media where you will save your backup Digital ID. If you don't see the window, your backup ID was saved in your Downloads folder. Copy the backup to the flash drive or other external media.

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Test or import your Digital ID

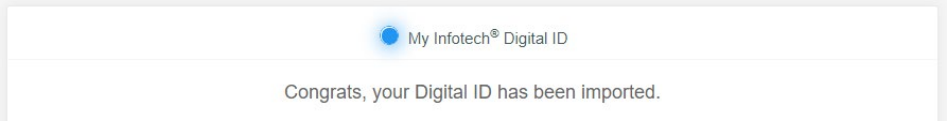
Once you've applied for, installed, and made a backup copy of your multi-browser Digital ID, test it out to make sure there will be no problems when bidding. Use a different browser or computer and import your backup ID. If you can import it without any problems, your ID was successfully created.

Before you begin

If you didn't backup your ID when it was installed, please do it now. Use the same computer and browser from when you created the Digital ID, and click **Back Up** on the Digital ID page. If you see a Save As window, navigate to the flash drive or other external media where you will save your backup Digital ID. If you don't see the window, your backup ID was saved in your Downloads folder. Copy the backup to the flash drive or other external media.

Ready to test or import your Digital ID?

1. Log in to the service using a different browser than the one where your Digital ID was created. For example, if you created the ID using Chrome, log in to the service using Edge.
2. Go to your account pages by selecting **My Account** from the **three lines** in the upper left corner. Click **Digital ID** from the sidebar menu.
3. If you see a message that the service couldn't find your Digital ID, then you're using a good browser to test your ID. If you don't see the message, use a different browser.
4. Click **Import my Digital ID**.
5. Click **Select backup file**.
6. Navigate to and select your backup ID file. It will be named **FIRST LAST Digital ID.json**. Click **Open**.



If your ID didn't import, please contact customer support: support@bidexpress.com. A member of our customer support team will be happy to assist you.

Bid Express® Vendor Roles and Access

Each member of your business must be assigned a Bid Express® role by a manager on the **My Profiles** tab. Managers cannot change their own role. Each role can access specific parts of the Bid Express service.

The vendor roles listed here are for the Bid Express service. To invite employees to your business or change an employee's ability to issue invitations to others, please see the *Infotech® Account* guide.

The vendor can choose from these roles.

Role	Abilities
Manager	Managers can: • Assign roles • Purchase subscriptions • Edit business information • Select a solicitation for bidding • Create, edit, withdraw, or submit bids • Ask questions in the Q&A forum of solicitations This role must have a Digital ID if working with owner–agencies that require Digital IDs.
Bidder	Bidders can: • Select a solicitation for bidding • Create, edit, withdraw, or submit bids • Ask questions in the Q&A forum of solicitations This role must have a Digital ID if working with owner–agencies that require Digital IDs.
Executive Manager	Executive Managers: • Have read–only access to everything, but cannot edit anything • Can ask questions in the Q&A forum of solicitations This role does not need a Digital ID.

Support hours: 7:00 am - 8:00 pm ET // 1-888-352-2439 Option 1 // support@bidexpress.com
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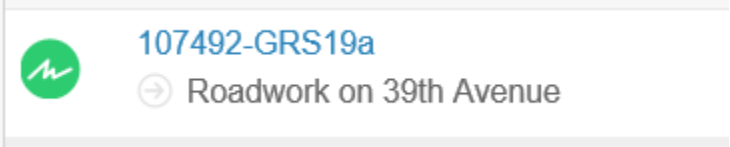
Electronic Signatures

All solicitations or requests for proposal on the Bid Express® service use either an Infotech® Digital ID or an electronic signature for verifying authorization to submit the bid. This signature graphic on the Solicitations tab indicates an electronic signature is required.



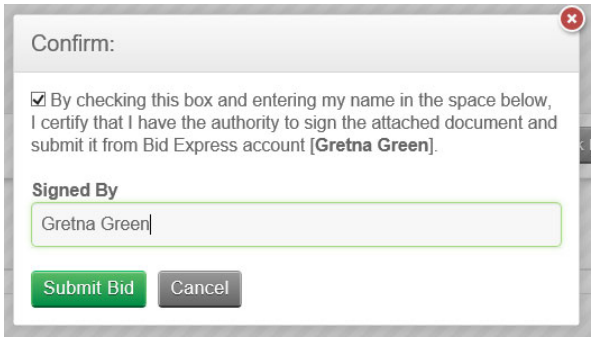
If you are not sure if you need an electronic signature or a Digital ID, please call customer support at 888 352-2439, and choose option 1.

Any member of your business with the correct role can edit and submit bids that use electronic signatures.

Submit a Bid with an Electronic Signature

All your items and other components of the solicitation should be complete before you submit a bid or response with an electronic signature.

1. Select the bid from the **Bids** tab if it is not already open.
2. Click **Submit Bid** or **Submit Response** at the top of the page.
3. The Bid Express service displays a submit bid or submit response window that authorizes the service to use your electronic signature to sign and encrypt your bid. Enter your electronic signature.



4. Click **Submit Bid** or **Submit Response**. The Bid Express service submits your bid and returns to the bid page and displays a bid submitted message. You will also receive an email confirmation of your submission.

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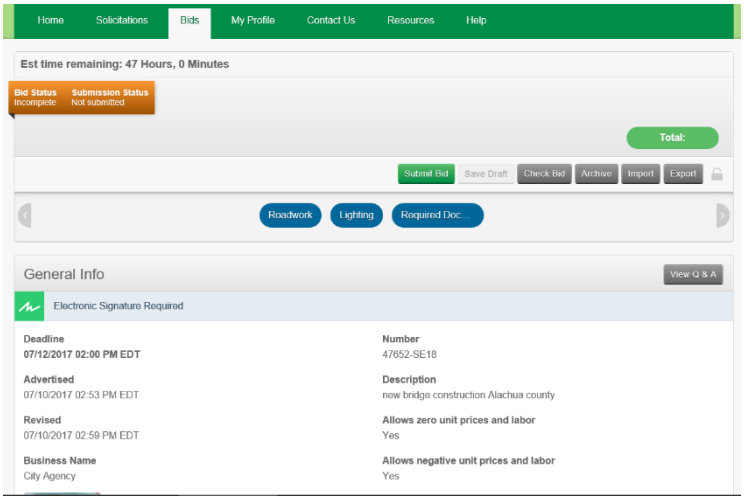
How to Bid

The actions you take when preparing a bid for a solicitation in the Bid Express® service can also be taken when you prepare a response to an RFP.

To start your bid or response, select the project from the **Solicitations** tab and click **Select For Bidding** or **Respond**. Solicitations with a FREE tag are sponsored by the agency. You must pay for the ones without the tag, either with a monthly subscription or the pay-as-you-go option.

Once the solicitation is selected, the Bid Express service moves and opens it on the **Bids** tab.



There is some information that applies to every section of the solicitation:

- Any member of your business with the correct role can edit and submit bids that use electronic signatures.
- Only members of your business that have approved Infotech® Digital IDs can edit and submit bids that require Digital IDs. Because IDs are stored on your computer, the user who selects the solicitation for bidding is the only one who should edit and submit it. Other members can work on the bid and then export their work to share with that user.
- Select the No Bid check box for any optional components on which you are not bidding. If all components of a bid are optional, at least one must be filled in completely in order for your bid to be marked complete.
- Fields marked with an asterisk (*) are required. Your bid will be incomplete if any required fields are left blank (unless those fields are in an optional component on which you're not bidding).
- If a component is an alternate, then the owner-agency may award the component independently of the solicitation award.
- Jump to a specific section of the bid by using the Go To options under the bid header.
- If you submit a bid and then receive an email notification that the owner-agency has changed the solicitation, you will have to update and resubmit your bid or it will be marked out-of-date.
- Use the Check Bid or Check Response feature to check for incomplete fields before submitting.

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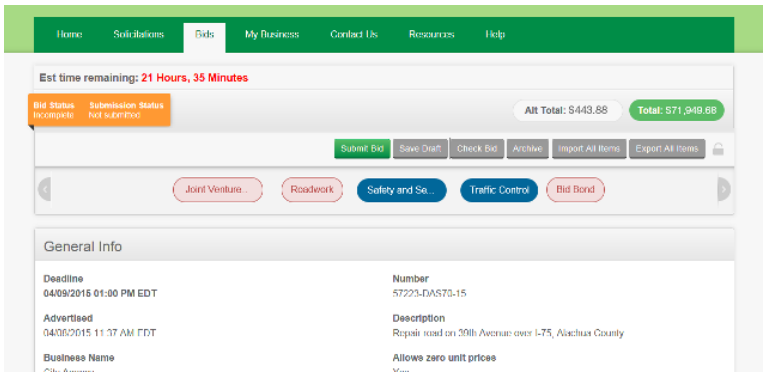
Submit bid

Bids that require a Digital ID cannot be submitted using a mobile device. For these bids, you must be using Windows operating system version 8 or newer and access the Bid Express service through Internet Explorer version 11 or newer.



Bids that require electronic signatures can be submitted using other operating systems and most web browsers. The actions you take when submitting a bid for a solicitation can also be taken when you submit a response to an RFP.

Once your bid or response is ready, you must submit it to the owner–agency. Owner–agencies will not be able to see your bid until after the bid deadline has passed, and they will only be able to see your last submitted bid, though they will be able to view the envelope after the deadline and without opening bids.

1. Select the bid from the **Bids** tab if it is not already open.
2. Click **Check Bid** or **Check Response** and fix any errors.
3. Click **Submit Bid** or **Submit Response** at the top of the page.
4. The Bid Express service displays a warning if the bid is incomplete and highlights the incomplete fields in red. Click **OK** to submit the bid or click **Cancel** to return to the bid page and fix any errors.
5. If you click **OK**, or if your bid is complete, the Bid Express service displays a submit bid or submit response window that authorizes the service to use your Digital ID or electronic signature to sign and encrypt your bid. Enter your electronic signature if necessary.
6. Click **Submit Bid** or **Submit Response**. The Bid Express service submits your bid and returns to the bid page and displays a bid submitted message.

Submission status

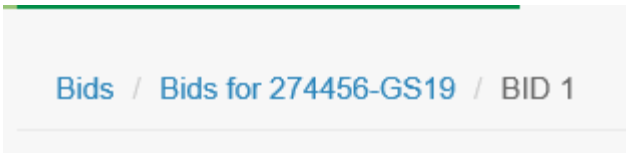
The Submission status bar in the top left corner of your solicitation displays the current submission status of your bid, from not yet submitted to the date and time it was submitted, and if it was complete.

Orange: Either your bid or response has not yet been submitted, or the submission has changed. This may mean the agency has changed the solicitation and issued an update, or that you changed the content of your bid, both of which require you to resubmit. It may also mean the last submission was incomplete, meaning all required fields were not filled in prior to submitting. Click **Check Bid** or **Check Response** to find the incomplete information.

Blue: A completed bid or response has been submitted at the posted date and time. If someone else in your business also submits bids, this may not be the time you submitted the bid.

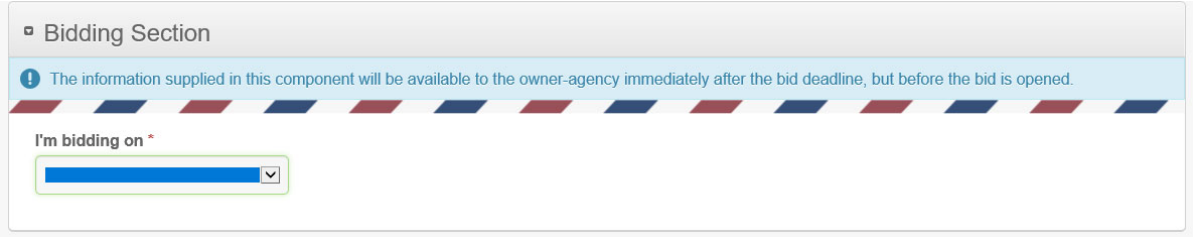
Bid Express® Vendor Multiple Bid Solicitations or Responses

Some agencies in the Bid Express® service have the option of creating solicitations or RFPs that will accept multiple bids or responses. If the solicitation or response you are bidding on allows you to submit separate bids for different work types or scopes of work, the navigation trail displays the number of the current bid; for example, BID 1.



If you are using the Bid Express pay-as-you-go payment option, you pay only one time for the solicitation.

Many agencies will use the envelope component, identifiable by the striped banner, at the beginning of a multi-bidding solicitation. This enables you to differentiate between the bids you submitted on a single solicitation. The agency can view the information you entered in the envelope after the bid deadline but before bids are opened.



Once you submit your bid, you'll be taken to a page that shows your bid submission history (and the envelope, if applicable) and the **Add New Bid** button to create your next bid.

1. Fill out the bid or response as normal.
2. Submit your bid or response.

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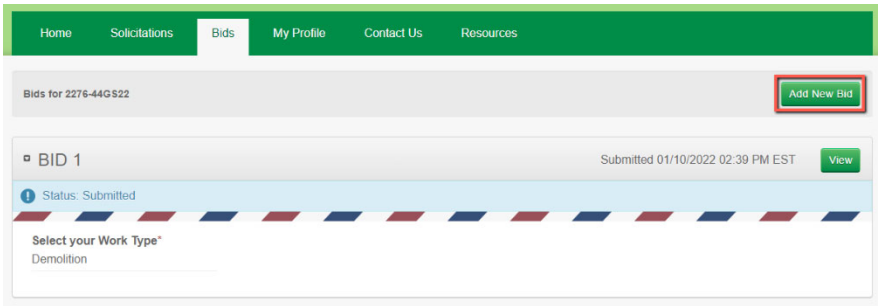
3. If you are bidding or responding again, click **Add New Bid** in the solicitation header and repeat the process for the next bid.

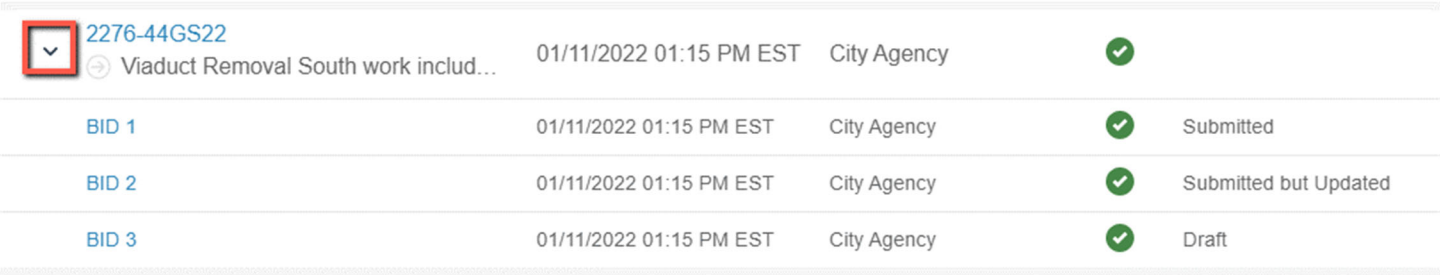


A bid submission receipt will be emailed to you each time you submit a bid. These receipts will include the bid number in the subject line and email body to make it easy to keep track of how many bids you and your company submitted.

Updating a Bid or Response

To update your bid or response, locate the solicitation or RFP number from the **Bids** tab if you are not already there.

Select the arrow for the solicitation to see the bids you've already submitted.



- Click the solicitation number to see your list of submitted bids and to add a new bid.
- From there, click **Add New Bid**, click **View** to see a bid that's already been submitted, or click **Open** to see the draft of your bid.
- Click the bid number to see the details for that bid.

Make any necessary changes. Save or submit your bid.

LOS ANGELES REGIONAL

CONTRACTOR DEVELOPMENT AND BONDING PROGRAM

The Contractor Development and Bonding Program assists contractors with their contracting capacity and business growth.

THE FOUR PILLARS OF CONTRACTOR DEVELOPMENT

- PRIME CONTRACTOR PARTNERSHIPS
- EDUCATION, TRAINING & CONTRACT SUPPORT
- BONDING, CONTRACT FINANCING & PROJECT ASSISTANCE
- ASSESSMENT & TECHNICAL ASSISTANCE

Assessment & Technical Assistance

- Enrollment in our Contractor Development and Bonding Program.
- Personal Account Manager to provide a professional assessment of your current capacity and growth needs.
- One-on-one consultation to develop a work plan aligned with your business needs and goals.
- Facilitated referrals to Program Partners and resources.
- Contracting opportunities and industry-related workshops and events sent via our *LA Contractor Weekly* bulletin.
- Referrals to specific project opportunities.

Bonding, Contract Financing & Project Assistance

- Assistance with obtaining or increasing bonding.
- Access to collateral support for bid performance and payment bonds for qualified contractors.*
- Contract review, project assessment, and field support for Program-bonded or financed contracts.
- Assistance with project risk identification and mitigation.
- Access to contract cash flow funding.
- Accounting cost subsidy for CPA-prepared financial statements.

**L.A. County has limited capacity.*

Education, Training & Contract Support

- Group Classes on public construction best practices led by industry experts.
- Contract-specific support on Regional Bond Program-supported contracts.
- Creation of individualized Contractor Profile to assist with business marketing.

Prime Contractor Partnerships

- Strategic alliances with Program Prime contractors including matchmaking and referrals.
- Networking with public agency staff and peer contractors.

PROGRAM SPONSORS

City of Los Angeles Founded 1781 · Metro · County of Los Angeles California · Los Angeles Public Works Founded 1906 · LA DWP · LA The Port of Los Angeles · Business, Jobs & Social Responsibility · LAWA Los Angeles World Airports

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www.imwis.com

Los Angeles County
Contractor Development and Bonding Program

FREQUENTLY ASKED QUESTIONS

"An inclusionary program to build a stronger region"

What services does the County's Contractor Development and Bonding Program (CDABP) provide?

The County's CDABP extends comprehensive capacity building, technical, bonding and contract financing assistance to small and diverse contractors seeking to pursue County construction-related contracts. Starting with a thorough assessment of your current business status, we identify areas of opportunity in order to help you better position your firm to successfully compete for and complete County contracts.

After your assessment, you'll be assigned a dedicated Account Manager who will work closely with you to tailor a technical assistance work plan and financial resources specific to your needs, which may include:

- ✓ One-on-one consultations
- ✓ Training clinics and learning immersion academies
- ✓ Help with prime contractor pre-qualifications
  - » Facilitation of prime or prime-sub contractor introductions
  - » Project/bid matches
- ✓ Assistance obtaining bonding, including bonding collateral support, if needed, and contract financing
- ✓ If you are awarded a County-related contract with bonding support, you will also receive on-going project assistance to help you successfully complete your contract.

Who is eligible to participate in the CDABP? Eligible firms include local small and diverse businesses who are certified or eligible for certification within one of the County's business enterprise categories. For detailed information on the County's certification programs, visit their Small Business Certifications webpage (https://iddweb.isd.lacounty.gov/DCA_eComplaint/SmallBusinessCertifications).

Why should small and diverse businesses enroll in the CDABP? LA County's CDABP provides game-changing resources for small and diverse businesses who want to expand their capacity and improve their opportunities for winning County contracts. For example, the inability to secure or increase bonding often impedes small and diverse contractors from bidding and/or pre-qualifying with prime firms and participating on public works projects. This program helps reduce such barriers, even offering bonding collateral support (standard surety bond premiums and commissions charged are not covered by the CDABP).

Similarly, not having access to the capital needed to fund the cost of doing the contract work that you've been awarded can be a major challenge, and little to no assistance is available through traditional lending sources. Through the CDABP, the County provides for up to $250,000 of contract-based financing with a low origination fee and very low interest rate, and not tied to your financials or credit.

This is a particularly good time to enroll, because in November 2021, President Joe Biden signed a $1.2 trillion infrastructure investment plan supporting a range of construction projects in localities across the nation, including Los Angeles County. If you are a small or diverse local business, the CDABP can assist you in competing for upcoming construction contracts!

My subcontracted work hasn't required bonding in the past, so how would I benefit from participating in the CDABP? While you may not always need to provide a bond for some subcontracted work, a bond will always be required if you want to bid directly with the County on small prime contracts – and being "bondable" is a significant competitive advantage when bidding on many subcontracting opportunities. Becoming "bondable" demonstrates that your company's capacity to perform work has been assessed and vetted by a third party, which is then reflected in the dollar amount for which you can bond. Even when a bond for subcontract work is not required, it is quite common to be asked to demonstrate that your company is "bondable" in order to meet contract owner or prime requirements. Pre-qualification requirements often include demonstrating your bond underwriting and/or financial capacity to perform work. The CDABP will assist you in meeting advance requirements with primes or prime-sub contractors pursuing or performing County work.

What is the cost to participate in the CDABP? The CDABP is sponsored by the County of Los Angeles, so, with one exception, all services are offered at no cost to participating contractors! If needed, the only cost you may incur is for having a Certified Public Accountant (CPA) prepare a financial statement for your company, a requirement for bonding. For those who qualify, the program even provides a one-time subsidy toward this CPA-prepared company financial statement. If the subsidy is provided to you, you will be asked to pay the first $500 toward the preparation of your financial statement and any costs in excess of what the $3,200 subsidy covers.

The CDABP is one of the County's tools to effectively support and increase the inclusion and participation of small and diverse contractors on County projects. Because barriers impede access, CDABP is intended to reduce and eliminate barriers wherever possible.

When should I look to enroll in the County's program? Should I wait until I've identified a County project for which I want to bid? Don't wait, enroll now! The earlier you enroll and have your company assessed, the sooner you'll be able to receive expert guidance and support in bidding suitable County projects. For example, getting pre-approved for a specific bonding amount will not only boost your company's credentials, but will also help you confidently identify and pursue County contracting opportunities within that range. Your CDABP Account Manager will be helping you every step of the way, including steering you toward opportunities with CDABP program prime partners. By planning ahead, your firm will be better positioned for consideration by the County's prime and larger contractors, who are always seeking qualified and certified firms to meet their project participation goals.

How long will it take for me to get approved for bonding or contract financing? The timing of the bonding or contract financing process depends mostly on you. The initial steps of preparing an underwriting package for bonding or prequalifying you for contract financing require gathering information about your company. If you have the necessary documentation and information complete and readily available, then the next steps of the process can move quickly. Your CDABP Account Manager is always on hand to answer questions and help guide you through the process.

Must I already be working with a bonding broker in order to participate? You do not already need to be working with a bonding broker. The CDABP will work with any bonding broker with whom you've already established a relationship that you wish to continue. In fact, the program can also work with your current surety agent to increase your existing bonding capacity with them as well. However, if you do not have a current broker, the program can provide for your consideration a list of brokers who work with smaller contractors and with program surety partners.

We look forward to hearing from you! Reach us at:

213-258-3000 | MWISInfo@imwis.com | www.LAConDev.com

SECTION 01 00 00

PROJECT GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of the Contract (1.02)
B. Permanent Utility Services (1.03)
C. Work not Included (1.04)
D. Drawings (1.05)
E. Time of Completion (1.06)
F. Long Lead Time Materials and Equipment (1.07)
G. Liquidated Damages (1.08)
H. Examination of Site and Work (1.09)
I. Cooperation (1.10)
J. Restrictions to the Work (1.11)
K. Cutting and Patching (1.12)
L. Air Quality Management District Rules (1.13)
M. Shop Drawings (1.14)
N. Cleaning (1.15)
O. Existing Utility Lines (1.16)
P. Protective Measures (1.17)
Q. Project Administration (1.18)
R. Best Management Practices (BMP) Requirements (1.19)

1.02 SCOPE OF THE CONTRACT

A. Work to be done under the Contract consists of furnishing all materials, all equipment, and performing the Work required by these Specifications and the Drawings hereinafter, described and necessary, to complete the construction of the Pathway Torrance Community Health and Wellness Center Renovation Project.

B. The work includes but is not limited to the following:

The building renovations will include heating, ventilating, and air conditioning; electrical, plumbing, and fire sprinkler systems; ceilings and lighting fixtures; a new elevator; security and low-voltage systems; information technology equipment; telecommunication upgrades; and code-compliant public and staff restrooms.

1.03 PERMANENT UTILITY SERVICES

The Work shall include all operations necessary to place required utility services in operating condition, including service lines from points of connection shown on Drawings, permanent meters, connections, and inspections. The work (when so scheduled) includes installation of telephone conduit, backboards, and terminal cabinets as shown, and cooperation with the serving utility company for the installation of other telephone equipment and cables. The County will arrange and pay for telephone switchboards, instruments, and cables.

All other expenses in connection with utility service installations shall be borne by the Contractor; however, upon receipt of certified cost statements, the County will reimburse Contractor for all charges made by serving companies in connection with permanent utility service installations.

Drawing notes and/or specification provisions of trade sections concerning utilities shall take precedence over the foregoing provisions.

1.04 WORK NOT INCLUDED

All items indicated on the Drawings as "N.I.C." (not in contract).

1.05 DRAWINGS

The Work shall conform to the Drawings entitled Pathway Torrance Community Health and Wellness Center Project with sheet numbers and titles as listed on Sheet No. 1 of the Drawings.

1.06 TIME OF COMPLETION

A. The work to be performed under the contract shall be completed within 300 calendar days, beginning with the date stipulated in the written notice to proceed issued by the Director.

B. Failure to complete the work by the identified completion date will be subject to the Liquidated Damages identified in Paragraph 1.08.

C. Final Payment Request shall be submitted within twenty (20) days after completion of the contract work, including all punch list items.

1.07 LONG LEAD TIME MATERIALS AND EQUIPMENT

A. The Contractor shall make every effort to demand of his Subcontractors and suppliers, relative to long lead time items, that they order such items well in advance of the scheduled time of installation. Time extensions for late ordering of such materials will not be allowed.

1.08 LIQUIDATED DAMAGES

A. All time limits stated in the Contract Documents are of the essence of the Contract and should the Contractor fail to complete the work required to be done on or before the time of completion as set forth in these specifications, including any authorized extension of time, it is mutually understood and agreed by and between the awarding entity and the Contractor that the use by the public of the Contract Work will be correspondingly delayed, and that by reason thereof, the awarding entity and the public will necessarily suffer great damages; that such damages from the nature of the case will be extremely difficult and impractical to fix; and that the awarding entity and the Contractor have endeavored to fix the amount of said damages in advance as follows:

1. The sum of $1,500 a day for each day's delay in the completion of the work beyond the time limit stipulated in Paragraph 1.06.

B. It is further mutually understood and agreed by and between the awarding entity and the Contractor that the sum of liquidated damages set forth above will be additive to a total of $1,500 a day for each and every day's delay in the event that the time limits, as hereinbefore specified, are concurrently exceeded. Any authorized extensions of time will be added to the time limits stipulated.

C. The Extended Overhead Daily Rate is not applicable when it is determined that liquidated damages apply due to a Contractor's delay.

1.09 EXAMINATION OF SITE AND WORK

A. Bidders must examine the location, physical conditions, and surroundings of the proposed Work and judge for themselves the extent to which these factors will influence the performance of the Contract Work.

B. The plans for the Work show conditions as they are supposed or believed by the Department to exist, but it is not intended, or to be inferred, that the conditions as shown thereon constitute a representation, express or implied by the County or its officers, that such conditions are actually existent, nor shall the Contractor be relieved of the liability under his Contract, nor the County, or any of its officers, be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the plans or referred to in the Specifications and the actual conditions revealed during the progress of the Work.

C. The County will conduct an optional prebid conference and job walk of the project site on Tuesday, March 17, 2026, at 10:00 AM.

1.10 COOPERATION

In the entrance and exit of all workers and in bringing in, storing, or removing of materials and the erection and maintenance of equipment and in the manner and time of prosecuting the work, the Contractor shall cooperate with those in authority on the premises to prevent the entrance of those whose presence is forbidden or undesirable, and he shall observe all rules and regulations in force on the premises and avoid undue interference with the convenience, sanitation, and routine of County departments occupying the premises.

1.11 RESTRICTIONS TO THE WORK

A. The Department reserves the right to determine which of the Contractor's operations are noise, dust, or dirt producing, or which disrupt utility service, or which constitute blocking of passageways, exits, entrances, etc., or which in any way constitute an interference in the proper function of the building.

B. Contractor shall maintain clear access to all protection equipment at all times, including access to fire hydrants.

C. Control of Tools: During the progress of the work, all hand tools, including power driven hand tools, cables, ropes, and other implements shall be transported and retained, except when in use in an approved locked toolbox. Care shall be taken that no tool is left unguarded or left where it might be taken by an unauthorized person.

D. All work by the Contractor is subject to inspection at any time and without notice by the County.

E. The working hours are Monday through Friday between 7:00 a.m. to 4:00 p.m. unless otherwise specified by the County.

1.12 CUTTING AND PATCHING

The Contractor shall perform all cutting, patching, and finishing operations occasioned by the Work under the Contract, whether or not such operations are indicated on the Drawings or specifically mentioned in the various sections of the Specifications. All such operations shall be performed in the best practices of the various trades involved and to the satisfaction of the Department. All patching and finishing materials shall match existing adjacent surfaces in every respect, including

design, type and quality of materials, finish, and color. Cutting, patching, and finishing shall include all such operations in existing areas required by the Work under the Contract.

1.13 AIR QUALITY MANAGEMENT DISTRICT RULES

The Contractor shall become familiar with requirements of the South Coast Air Quality Management District Rules 50, 66, 66.l, 66.2, 403, and 1113. The Contractor is responsible for conforming to and using materials which meet the requirements of the above-specified rules.

1.14 SHOP DRAWINGS

Furnish shop drawings as required in the various sections of the Specifications or as requested by the Department. Unless otherwise specified, submit six (6) copies of shop drawings to the Department for review. One set will be returned to Contractor marked "no exceptions noted" or "exceptions noted." If changes are required, six (6) copies of corrected shop drawings shall be delivered to the Department. Shop drawings shall be of sufficient size and scale to clearly show all details; shop drawings of millwork and cabinet work shall show molding full size. No materials shall be furnished or Work done on items requiring shop drawings prior to acceptance. Acceptance of shop drawings shall not relieve the Contractor from responsibility for deviations from the Contract Documents, nor from responsibility for errors or omissions of any sort in the shop drawings. Neither does such acceptance relieve the Contractor from his responsibility for the correct installation, or for the proper operation in service, of items requiring shop drawings.

1.15 CLEANING

During progress of Work and upon completion of each part of the Work as defined by the sections into which these Specifications are divided or as separated by the various trades involved in the Work, each area shall be cleaned of debris emanating from the Work. The Contractor shall remove excess materials, waste, rubbish, and debris, and his construction and installation equipment from the premises. Any dirt and stains caused by the Work under the Contract shall be removed from the surfaces of the structures and from equipment and fixtures. Final acceptance of the Work done under these Specifications will not be given until the cleaning has been inspected and approved by the Department.

1.16 EXISTING UTILITY LINES

Except as indicated on the Drawings or in the Specifications, the Contractor will not be liable for the rerouting of existing active underground lines, which may be discovered during the progress of the Work.

1.17 PROTECTIVE MEASURES

The Contractor shall provide and maintain substantial and adequate protection as may be required to protect new and existing Work and all items of equipment and furnishings for the entire duration of Work.

The Contractor shall repair or make good any and all damage or loss he may cause to the building or other County property to the full satisfaction of the Department.

1.18 PROJECT ADMINISTRATION

All materials supplied and all Work done by the Contractor shall be under the general administration of the Department and in accordance with the Drawings and Specifications.

1.19 BEST MANAGEMENT PRACTICES (BMP) REQUIREMENTS

A. The Contractor shall comply with Section 01 57 00 (for projects less than one acre), Section 01 57 00 (for projects greater than one acre), the Los Angeles County Department of Public Works Construction Site Best Management Practices (BMP's) Manual, latest edition. A copy of the BMP Manual can be obtained at the Los Angeles County Department of Public Works Cashier's Office, 900 South Fremont Avenue, Alhambra, CA 91803, (626) 458-6959.

   For projects where the disturbed area is one acre or more, the Contractor must submit a Storm Water Pollution Prevention Plan (SWPPP) per Section 01 57 00 of these provisions.

B. Related Work: Cleaning; Section 01 74 23.

* * * *

SECTION 01 14 00

ALTERATION PROJECT PROCEDURES

1.00 GENERAL

1.01 CONTRACTOR′S USE OF THE PREMISES

A. The Contractor will be restricted in the use of the site to that area designated by the County. If the allotted space is too restrictive, provide a written request to the County, identifying the amount of additional area required, the reason why the existing area is inadequate, and any incentives for the County to provide the additional space.

B. Obtain and pay for the use of additional storage or work areas if required for operations.

1.02 INTERRUPTION OF EXISTING SERVICES

A. The facility is in continuous operation.

B. If an interruption of any existing utilities and/or equipment operations to the existing building will be required provide the County a minimum of 7 days notice for minor interruption and 14 days advance notice for major interruption, obtain County′s permission and if required by the County, interrupt service only during non-business hours unless otherwise noted in the Contract Documents. Interruptions affecting areas outside the tenant improvement space constitutes a major interruption.

1.03 PROTECTION OF EXISTING IMPROVEMENTS

A. Take all precautions necessary to protect existing building, utilities and other site improvements from damage due to the work of this Project, and be responsible for their restoration of any damaged property to its original condition if damage is a result of the Contractor′s construction activities.

B. Cooperate with County to sequence the work so as not to unnecessarily interfere with operation of occupied facilities. Prior to demolition or construction work, consult with County to determine a construction schedule which will permit the existing facilities to function without interruption. Thereafter, Contractor shall provide County′s Representative with a minimum of fourteen days advance notice, in writing, of anticipated portion of the Work which may, because of noise or otherwise, require advance operational planning.

C. In planning and performing the Work, make every effort to maintain all pollutants, including noise, dirt and dust levels at the absolute minimum possible.

D. Continuously maintain ingress and egress to and from existing building for purposes of fire and emergency entrance and escape, loading and delivery, and building maintenance, to the satisfaction of the County and authorities having jurisdiction.

E. Protect all utilities against interruption, damage or contamination during construction; if necessary, provide temporary utilities to maintain services continuously. Such utilities shall include, but shall not be limited to, electricity, water, gas, sewerage, telephone, data, oxygen, nitrous oxide, vacuum and compressed air.

F. Provide temporary barriers to separate occupied areas from work areas. Seal all joints to create dust-proof enclosures.

G. Limit equipment and vehicles in ingress and egress and use of service areas to the minimum essential to operations. If there is unavoidable conflict with Contractor's equipment in such areas, upon request of County, remove such equipment immediately to facilitate emergency services, and within a reasonable time, for all other services.

1.04 DAMAGE AND RESTORATION

A. Damage to existing or new work caused by equipment or other operations, whether accidental or made necessary by reason of Contract requirements, shall be restored or replaced as specified or directed by the County, at Contractor's sole expense.

B. Restoration shall be equal to the original work, and finishes shall match the appearance of, as nearly as possible, like existing adjacent work. Restoration shall be subject to acceptance by the County and shall be made as necessary at Contractor's sole expense.

C. Work not properly restored or where not capable of being restored as intended under these specifications shall be removed and replaced as directed by County, at Contractor's sole expense.

2.00 PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Type and quality of existing products: Determine by inspection and testing products where necessary, referring to existing work as a standard.

3.00 EXECUTION

3.01 EXAMINATION

A. Verify that demolition is complete and areas are ready for installation of new work.

B. If actual conditions differ from conditions shown on the Contract Documents, immediately report the differing conditions to the Director and wait for written instructions.

C. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

A. Cut, move or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage. Replace materials as specified for finish work.

C. Remove debris and abandoned items from area.

D. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.

E. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity.

3.03 INSTALLATION

A. Coordinate work of alterations and renovation to expedite completion.

B. Designated areas: Complete in all respects.

C. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.

D. Install products as specified in each Section.

3.04 TRANSITIONS

A. Where new work abuts or aligns with existing, perform a smooth and even transition. Patch work to match existing adjacent work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along with a straight line at a natural line of division and make recommendations to Director.

3.05 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces which become damaged, lifted, discolored or showing other imperfections.

B. Repair substrate prior to patching finish.

3.06 FINISHES

A. Finish surfaces as specified in each Section.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

* * *

SECTION 01 23 00

ALTERNATIVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Alternative proposals as identified on the drawings and described herein shall state the net sum to be **added to** Lump Sum Bid in the event that the Alternative proposal is included. Dollar amounts for Alternative proposals shall be inserted in the "Form of Bid".

B. If the County determines to award a contract, it shall be awarded to a responsive and responsible Bidder with the lowest bid price. The lowest bid price shall be determined by adding the following items: Lump Sum Bid in Words (1) + [Extended Overhead Daily Rate (2) x Multiplied by 30 days] + Deductive Alternate #1 (3) + Deductive Alternate #2 (4) + Deductive Alternate #3 (5) + Deductive Alternate #4 (6) + Deductive Alternate #5 (7) + Deductive Alternate #6 (8) = Total Lump Sum Bid. Preference as stated in Section 00 01 00, 1.30, will be applied to the Total Lump Sum Bid, if applicable, to determine the final total bid amount. This does not preclude the Board of Supervisors from selecting any combination of alternates after the lowest responsible bidder has been determined.

C. Include in the Alternative proposal all changes in cost resulting in the work of all trades affected thereby. Work shall be performed in accordance with the drawings and specifications affected unless otherwise specified.

D. Contractor shall determine to his own satisfaction the extent the work is affected by the Alternative proposals and shall make full and proper allowance therefore in the preparation of this proposal.

1.02 BID ALTERNATIVES:

1. <u>Deductive Alternate No. 1: Omit CCTV Camera System</u>

The lump sum bid amount reduction for the exclusion of the CCTV camera system scope of work entirely including equipment, network cabling, servers, and mounting hardware. Scope of work is described in Attachment K to the project manual.

2. **Deductive Alternate No. 2: Omit television and mounting equipment**

The lump sum bid amount reduction for the exclusion of television and mounting hardware from the community room. Scope of work is described in Attachment K to the project manual.

3. **Deductive Alternate No. 3: Reduce the number of EV Charging Stations.**

The cost difference (delta) for the reduction from 8 fully connected Electric Vehicle Charging Station (EVCS) stalls to 2 EVCS stalls and 6 Electric Vehicle capable stalls. Scope of work is described in Attachment K to the project manual.

4. **Deductive Alternate No. 4: Relocate north fence and gates**

The cost difference (delta) for the relocation of the fence and gates from the northern property line at back of sidewalk to line the face of the building. Scope of work is described in Attachment K to the project manual.

5. **Deductive Alternate No. 5: Omit north and south exterior break areas**

The lump sum bid amount reduction for the exclusion of the north and south staff exterior break area improvements. Scope of work is described in Attachment K to the project manual.

6. **Deductive Alternate No. 6: Omit new Community Plaza Area**

The cost difference (delta) for the exclusion of the colored concrete paved plaza area, and the installation of a concrete walkway to provide an accessible path of travel. Scope of work is described in Attachment K to the project manual.

* * *

SECTION 01 26 13

CONTRACTOR'S REQUEST FOR INFORMATION

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers general requirements for Contractor's Requests for Information (RFI).

B. The Contractor will prepare and submit RFIs as directed by the County Project Manager.

C. Related Sections:

1. General and Supplementary Conditions for changes in the Work.

2. Section 01 31 19: Progress Meetings

3. Section 01 33 00: Submittals

1.02 SUBMITTALS

A. Submit a Request for Information to the County when:

1. An unforeseen condition or constructability question occurs.

2. Questions regarding information in the Contract Documents arise.

3. Information not found in the Contract Documents is required.

B. When possible, request such clarification either verbally or in writing at the next scheduled Project meeting. When the RFI is answered at the Project meeting, number the RFI and enter the response into the meeting minutes.

1. When the urgency of the need or the complexity of the item makes clarification at the next scheduled Project meeting impractical, prepare and submit a formal written RFI to the County.

C. RFIs shall be submitted within a reasonable time frame so as not to interfere with or impede the progress of the Work. The Contractor shall make every effort to keep the number of RFIs to a minimum. If the number of RFIs becomes unwieldy, the County may require the Contractor to abandon the RFI process and submit requests as either submittals, substitutions, or requests for change.

D. When the response to an RFI effects the cost or time duration of the project, notify the County in accordance with the General Conditions at the time of the submittal. Notification shall occur prior to commencing such work, so that the change order process can be initiated.

1. At time of the time of submittal of the RFI, notify the County to the time available before the response will cause a time or cost impact to the Project.

2. An answered RFI shall not be construed as approval to perform extra work.

E. Form of Submittal:

1. Submit legible written RFIs on a standard CSI or AIA preprinted form or other such form as approved in advance by the County. Each request shall include the following information:

a. Project name, as listed on the Contract Documents, and County Specs. Number;
b. Date;
c. RFI number;
d. Name, address, telephone and e-mail address of the Contractor;
e. Number and title of affected Specification Section(s);
f. Drawing numbers and detail numbers as appropriate;
g. Indicate if the RFI will result in a time or cost impact;
h. Clear, concise explanation of information or clarification requested;
i. Blank, lined spaces for Architect's response;
j. Signature block for County to acknowledge review of Architect's response;
k. Mark each page of each RFI attachment in the lower right corner with the RFI number;
l. Number submitted RFIs consecutively; and
m. Sign and stamp all RFI forms. RFIs from subcontractor or material suppliers shall be submitted through the Contractor. Contractor shall review all such information request prior to submitting to the County.

F. RFIs not meeting the requirements of this Section will not be answered and any consequential impact on the project shall be the sole responsibility of the Contractor. Unanswered RFIs will be returned with a stamp or notification "Not Reviewed."

G. RFI Log: Contractor shall maintain and update the log weekly and furnish to the County when requested. The log shall contain the following minimum information:

a. RFI number
b. Date submitted
c. Brief description of content or subject
d. Date answered

H. Allow a minimum of five (5) working days for review and response. The response time will be increased if more information is required, when the RFI is submitted out of sequence, or if in the opinion of the County, more time is required to answer the RFI.

1.03 QUALITY ASSURANCE

1. Carefully review the Contract Documents before submitting a RFI to the County. Verify that the information requested is not indicated in the Contract Documents or cannot be determined from a careful review.

    1. The County may not answer RFIs for information that is readily available in the Contract Documents.

2. RFIs requesting clarification of coordination issues, shall include the Contractor's suggested solution as an attachment to the RFI.

    1. Such coordination issues include, but are not limited to, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items.

    2. Provide scale drawings or sketches indicating the proposed solution.

    3. RFIs which do not include a suggested solution will not be answered.

3. Do not use RFIs for the following:

    1. To request approval of submittals.

    2. To request approval of substitutions.

    3. To request changes to the Contract Documents and to confirm action taken by the Contractor for requested changes/substitutions to the Contract Documents.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

* * *

SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Submit to the Department, six (6) copies of an accurate and realistic Schedule of Values allocated to the various portions of the work, ten (10) calendar days from issuance of Notice to Proceed under the Consultant Services Agreement.

B. The Contractor will prepare and submit the Schedule of Values as directed by the County Project Manager.

C. The Schedule of Values, unless objected to by the Department, shall become the basis for the Contractor's applications for payment.

1. Upon request by the Department, support values given with data that will substantiate their correctness.

D. Related requirements specified elsewhere.

1. Section 01 00 00, "Project General Requirements".

1.02 FORM OF SUBMITTAL

A. Type schedule on 8-1/2" x 11" white bond paper. Identify schedule with:

1. Title of project and location.

2. Specification number.

3. Name and address of Contractor.

4. Date of submission.

B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress

payments during construction.

C. Use the Table of Contents of the project specifications as a basis for the format for listing component items.

1. Identify each line item with the number and title of the respective section of the specifications.

D. List sub-values of major products or operations for each line item. Additional sub-values may be requested by the Department.

E. Costs for the various portions of the work:

1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

2. For items on which progress payments will be requested, list the total installed value, including Contractor's overhead and profit.

F. A similar detailed schedule, itemizing costs and/or credits in a form satisfactory to the Department, shall accompany all quotations for changes in the work or for extra work. Refer to article entitled "Provisions for Extras" in the General Conditions of the project specifications.

G. Round off figures to nearest ten ($10) dollars wherever possible.

H. The sum of all values listed in the schedule shall equal the total contract sum.

1.03 REVIEW AND RESUBMITTAL

A. After review by the Department, revise and resubmit Schedule as required. Resubmit revised Schedule in same manner.

B. Progress payments will not be made until Schedule has been approved.

* * *

SECTION 01 29 76

PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 1 Section "Allowances" for procedural requirements governing handling and processing of allowances.
2. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Division 1 Section "Unit Prices" for administrative requirements governing use of unit prices.
4. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule. Cost-loaded CPM Schedule may serve to satisfy requirements for the Schedule of Values.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets.
b. Submittals Schedule.
c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to Architect through Project Manager at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of G 703 Pay Application
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Project Manager and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to Architect by the 15th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Payment Application Forms: Use AIA Document G703 as form for Applications for Payment.

E. Payment Application Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included at end of this Section.

F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Project Manager will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

G. Transmittal: Submit 3 (three) signed and notarized original copies of each Application for Payment to Project Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

I. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

K. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. "Contractor's Affidavit of Payment of Debts and Claims."
5. "Contractor's Affidavit of Release of Liens."
6. "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took

possession of and assumed responsibility for corresponding elements of the Work.

9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SAMPLE APPLICATION AND CERTIFICATE FOR PAYMENT ATTACHED.

* * *

SAMPLE

APPLICATION AND CERTICATE FOR PAYMENT

TO: LACDPW - PROJECT MANAGEMENT DIVISION II
PUBLIC WORKS HEADQUARTERS BLDG.
900 SOUTH FREMONT AVENUE, 5TH FLOOR
ALHAMBRA, CA 91803

Project:
Contract No:
CP No.:

Application No: #REF!
Invoice No: #REF!
Period To: #REF!

From: Contractor

Project No: #REF!
Invoice Date: #REF!
Contract Date: #REF!

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as, shown below, in connection with the contract.
Continuation sheet is attached.

1 ORIGINAL CONTRACT SUM $ -
2 Net change by Change Orders $ -
3 CONTRACT SUM TO DATE $ -
4 TOTAL COMPLETED & STORED TO DATE $ -
(Column G on Continuation Sheet)
5 RETAINAGE
a 0.00% of Completed Work $ -
(Column D+E on Continuation Sheet)
b 0.00% of Stored Material $ -
(Column F on Continuation Sheet)
Total Retainage (Line 5a+5b or Total in Column I on Continuation Sheet) $ -
6 TOTAL EARNED LESS RETAINAGE $ -
(Line 4 less Line 5 Total)
7 LESS PREVIOUS CERTIFICATES FROM PAYMENT
(Line 6 from prior Certificate)
8 CURRENT PAYMENT DUE $ -
9 BALANCE TO FINISH, INCLUDING RETAINAGE
(Line 3 less Line 6)

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Previously approved Change Orders	$ -	$ -
Change Orders approved this period	$ -	$ -
TOTALS	$ -	$ -
Net Change Order Total	$ -	

To the best of my knowledge and belief, I certify that all items, units, quantities, and prices of work shown on this application for payment are corrects; that all the work has been performed and material supplied in full accordance with the terms and conditions of this Contract on this projects; that this application for payment is a true and correct statement of the contract account up to and including the last day of period covered by this application and that no part 'Current Payment Due' has been received.

CONTRACTOR:
BY: _____ Date: _____

CERTIFIED AND APPROVED AS PER TERMS OF CONTRACT

To the best of my knowledge and belief, I certify that this application for payment does not exceed (_%) of the value of the work completed since the previous application for payment, if any plus (_%) of the value acceptable or stored materials for incorporation into work, but not installed, if any.

I further certify that this application for payment covers full payment for work completed since the previous application for payment and that any payment for prefabricated stored materials does not exceed (_%) of the value of the materials.

AMOUNT CERTIFIED..... $ -

BY: _____ Date: _____
Inspector

BY: _____ Date: _____
Architect/Engineer

BY: _____ Date: _____
County Project Manager

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptable of payment are without prejudice to any rights of the Owner or Contractor under this Contract except as set forth in the Contract.

SAMPLE

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702™–1992, Application and Certificate for Payment, or G732™–2009, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION *(D + E)*	THIS PERIOD	MATERIALS PRESENTLY STORED *(Not in D or E)*	TOTAL COMPLETED AND STORED TO DATE *(D+E+F)*	% *(G ÷ C)*	BALANCE TO FINISH *(C – G)*	RETAINAGE *(If variable rate)*
	GRAND TOTAL								

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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101210ACD44

Sample

SECTION 01 31 00

COORDINATION AND MEETINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. Coordination
B. Preconstruction Meeting
C. Progress Meetings
D. Preinstallation Meetings

1.02 COORDINATION

A. Coordinate scheduling, submittals, and work of the various Sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later and for accommodating items to be installed by the County.

B. Coordinate sequence of work to accommodate County occupancy as specified in Section 01 00 00.

1.03 PRECONSTRUCTION MEETING

A. Construction Manager/County Project Manager will schedule a meeting after Notice of Award.

B. Attendance Required: Architect, Project Coordinator, Prime Contractors, Major Subcontractors, Project Inspector and key County personnel.

C. Agenda:

1. Contract Agreement

a. Transmit Performance and Material Bonds to Architect
b. Review General/Supplementary Conditions
c. Deferred Approvals

2. Receive documentation from Contractor

a. Construction Schedule
b. Schedule of Values

c. List of Subcontractors with Addresses and Phone Numbers
d. List of Submittals and Estimated Date of Submittal

3. Project Administration

a. Application for Payment, Project Schedule, Lien Release, As-built Documents, Contract Administration
b. Change Orders and Proposal Requests
c. Submittals and Substitutions, Deferred Approvals
d. Site Meetings
e. Testing Lab
f. Verified Reports

4. Special County Conditions

a. Temporary Facilities
b. County Occupancy
c. Work by County
d. Access to Site – County Contract

5. Construction Process

a. Contractor to give Overview of Construction
b. Contractor to identify items to be selected by Architect/County and date selections must be made.
c. Contractor to review special requirements for equipment, safety, and noise.

6. Project Close-Out

a. Close-out Binder
b. As-Built Documents
c. Final Verified Reports

D. Architect or County Project Manager to record minutes and distribute copies within three days after meeting to participants, Architect and those affected by decisions made.

1.05 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work as needed.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Project Coordinator, Prime Contractors, major Subcontractors and suppliers, Project Inspector, key County personnel and Architect as appropriate to agenda topics for each meeting.

D. Agenda

1. Review Minutes of Previous Meetings
2. Review of Work Progress
3. Field Observations, Problems, and Decisions
4. Identification of problems which impede planned progress.
5. Review of Submittals Schedule or Status of Submittals.
6. Review of Off-site Fabrication and Delivery Schedules
7. Maintenance of Progress Schedule
8. Corrective Measures to Regain Project Schedules
9. Planned Progress During Succeeding Work Period
10. Coordination of Projected Progress
11. Maintenance of Quality and Work Standards.
12. Effect of Proposed Changes on Progress Schedule and Coordination
13. Other Business Relating to Work

E. Architect or County Project Manager to record minutes and distribute copies within three days after meeting to participants, Architect, and those affected by decisions made.

1.06 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a preinstallation meeting prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.

2. Review coordination with related work.

E. Contractor to record minutes and distribute copies within three days to participants, Architect and those affected by decisions made.

1.07 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in Section 01 33 00.

B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate request for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

1.08 COORDINATION OF SPACE

A. Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routings shown for pipes, ducts, and conduits as closely as practical, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximum accessibility for other installations, for maintenance and for repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.09 COORDINATION WITH WORK BY COUNTY

A. Coordinate any work by County.

1.10 COORDINATION OF CONTRACT CLOSE-OUT

A. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.

B. After County occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents to minimize disruption of County's activities.

C. Assemble and coordinate close-out submittals specified in Section 01 77 00.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

* * * * *

SECTION 01 31 19

PROGRESS MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scheduling and administration of progress meetings.

1.02 RELATED REQUIREMENTS

A. Instructions to bidders.

B. Project general requirements.

C. Construction schedules.

D. Shop drawings, product data and samples.

E. Quality control.

F. Temporary Facilities.

1.03 PROGRESS MEETINGS

A. The County will schedule and administer progress meetings throughout the construction of the work.

B. The County will make physical arrangements, prepare agenda and distribute notice for the meetings to participants in advance of meeting date.

C. The Project Manager will preside at meetings. Meeting minutes will be recorded and copies will be distributed to participants prior to next meeting.

D. Location of meetings: Project's field office or Project Manager's office.

E. Attendance: Project Manager, Inspector, Contractor, job superintendent, subcontractors, suppliers and others as appropriate to agenda; Architect/Engineer and others shall attend when appropriate.

F. Minimum Agenda:

1. Approval of minutes of previous meetings.

2. Review of work progress.

3. Field observations, problems and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

* * *

SECTION 01 32 00

CONSTRUCTION SCHEDULES

Critical Path Method Schedule Integration System

1. GENERAL

DESCRIPTION – The work specified in this section consists of developing and maintaining a Critical Path Method (CPM) schedule integration system for the contract. Planning, scheduling, management, and execution of work in accordance with contract documents are the sole responsibility of the Contractor.

1.1 Related General Conditions/General Requirements Articles, and Specifications Sections

a.	General Conditions Articles	12.A, 12.B, 12.C
b.	General Conditions Articles	14
c.	General Conditions Articles	15.B.e.3
d.	General Requirements Articles	1.02
e.	General Requirements Articles	1.06

1.2 Generate a CPM schedule integration system using commercially available CPM scheduling software program containing direct file interchange capability with the software program used by the Los Angeles County Department of Public Works.

1.3 For scheduling submittals produce Precedence Diagram Method (PDM) and time scaled network diagram submittals on D-Size (22-inch by 34-inch) or E-Size (34-inch by 44-inch) medium suitable for reproduction. Print schedule submittal tabular reports on A-Size (8 ½-inch by 11-inch) paper. For scheduling submittals, the Contractor shall include backup diskettes. The backup diskettes shall be made directly from the CPM scheduling software and shall contain all files of the project that can be restored by the County for its evaluation and analysis.

1.4 Contract milestone dates, County furnished goods, availability dates, and real estate availability dates, are unique zero duration activities as a “start no earlier than” or “finish no later than” milestone. Each milestone activity will constrain its dependent work. Assume Notice to Proceed (NTP) is given at day zero for calculation of constraint dates for milestones.

1.5 Float is not for exclusive use or benefit of either the County or Contractor but is an expiring resource available to both parties on a

nondiscriminatory basis. Float is used by either party, as needed to meet contract milestones and contract completion dates. Contract time extensions for contract performance will be granted only to extent that delays or disruptions to affected work paths exceed total float along those paths of current contract schedule (update schedule) in effect at time of delay or disruption. These delays or disruptions must also cause end date of work to exceed current contract date or milestone date and be beyond control and without fault or negligence of Contractor or any subcontractor at any tier. If delays or disruptions impact an already negative float path, Contractor will not receive a time extension unless and until activity with highest float is driven even further negative.

1.6 Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times or durations should be submitted with written justification to obtain the County's acceptance. Use of float time disclosed or implied by use of alternate float suppression techniques shall be shared to proportionate benefit of the County and Contractor. Use of any technique solely for purposes of suppressing float will be cause for rejection of schedule submittal.

1.7 Planning units – Scheduling software supports schedule Planning Units of hours, days, weeks or months. The standard time unit applied to the schedule integration system is defined as days.

1.8 Schedule network – Use Retained Logic CPM Precedence Diagram Method of scheduling.

1.9 Analyze in detail, activities included in contract schedule to determine activity time durations in units of working days. Base durations on engineering and design resources, drawing production, submittal review periods, procurement lead time and duration, manufacturing times, labor (crafts), equipment, and materials required to perform each activity on a normal workday basis. No on-site activity shall have a duration over 10 working days except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment, and concrete curing.

2. PRODUCTS

SUBMITTALS – Submit one original and four copies of schedule unless specified otherwise. Provide submittals specified in this section to the County for review and acceptance.

2.1 Baseline CPM Contract Schedule

Provide the County with a means to monitor and follow progress of all phases of work, with contractually specified interim milestones and completion dates, and with constraints, restraints or sequences included in the contract. Degree of schedule detail required shall include factors to the satisfaction of the County, including but not limited to the following:

2.1.1 Master list of submittals and all other requirement as referenced in Section 01 33 00 Submittals.

2.1.2 Contract interim milestones and contract completion date, substantial completion dates, constraints, restraints, sequence of work indicated.

2.1.3 Type of work to be performed, sequences, and labor trades involved.

2.1.4 Purchases, manufacture, tests, delivery, and installation activities for major materials and equipment.

2.1.5 Deliveries of County furnished goods and/or materials in accordance with dates or schedule windows of such times set forth in the contract or furnished by the County.

2.1.6 Preparation, submittal, and acceptance of shop and/or working drawings and material samples showing a 30-day minimum time specified for the County and third party reviews of normal or routine submittals, so identified in the specifications, and the same time frame shall be allowed for at least one re-submittal or submittals so identified in the contract documents.

2.1.7 Approvals and permits required by regulatory agencies or other third parties.

2.1.8 Schedules for subcontract work.

2.1.9 Assignment of responsibility for performing specific activities.

2.1.10 Access and availability to work areas.

2.1.11 Identification of interfaces and dependencies with preceding, concurrent and follow-on construction or contractors and utilities.

2.1.12 Actual tests, submissions of test reports, and acceptance of test results.

2.1.13 Start up, testing, training, and assistance required under the contract.

2.1.14 Planning for phased or total takeover by the County.

2.1.15 Punch-list and final clean up.

2.1.16 Identification of construction restrictions as well as any activity requiring unusual shift work, such as two shifts, six day weeks, specified overtime, or work at times other than a standard work day.

2.2 The schedule of values shall be prepared and submitted together with the construction schedule.

2.3 Failure to meet these requirements may result in a determination and recommendation that the Board of Supervisors determine that the successful bidder as non-responsible because such failure reflects the bidder's ability to manage the work.

3. Current CPM Contract Schedule Updates

3.1 Initially, upon approval of the baseline CPM contract schedule, establish the current CPM contract schedule from the baseline CPM contract schedule. Thereafter, update the current contract schedule monthly with data date designated by the County. Use updated current contract schedule for subsequent planning, scheduling, and execution of work to be accomplished. Obtain County prior acceptance before making deviations in logic and activity durations in the current CPM contract schedule.

3.2 Participate with the County in periodic meetings, at least monthly, on dates directed by the County and seven days prior to monthly status. At meeting held seven days prior to the data date, provide preliminary updated current CPM contract schedule that forecasts project status on the data date and contains actual start and actual finish dates for activities in progress or completed, remaining durations of activities already in progress, percent completed, logic changes, new or deleted activities, and new change order/modifications.

3.3 Submit a stand alone portion of the network (fragnet), if current progress reflects negative float of minus 10 days or more for a milestone activity, as indicated by most recent CPM contract schedule, allowed by contract as amended by approved change orders/modifications. Show activities affected, date delay or disruption occurred or how productivity was impacted, and unmitigated impacts to schedule caused delay or disruption. Submit similar fragnet showing Contractor's plan to mitigate delay or disruption and subsequent impacts to schedule at the County's request. Provide written narrative describing circumstances that caused delay or disruption and methodology used to determine extent of delay or disruption. Submission of such fragnets does not constitute permission to proceed with plan. Execute some or all of the following remedial actions, and submit a recovery schedule that may include:

3.3.1 Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

3.3.2 Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or combination of the foregoing to eliminate the backlog of work.

3.3.3 Reschedule the work in conformance with the specifications requirements.

4. Before implementing any of the above actions, notify and obtain acceptance from the County. If such actions are accepted, incorporate current CPM contract schedule revisions before next update.

5. Addition of equipment or construction forces, increasing working hours or other methods, manner, or procedure to return to contractually required completion date will not be considered justification for a change order/modification, nor be treated as acceleration where the need for a recovery schedule has been caused by the Contractor and/or its subcontractors or suppliers at any tier.

6. When the Contractor experiences change order/modifications or delays and a time extension is requested, submit to the County a written time impact analysis illustrating the influence of each change or delay on current contract schedule completion date utilizing current CPM contract schedule. Include in each time impact analysis a fragnet demonstrating how the Contractor proposes to incorporate the change order/modification or delay into the current CPM contract schedule. The fragnet shall contain a sequence of new and/or activity revisions that are proposed to be added

to the current CPM contract schedule in effect at the time change or delay is encountered to demonstrate influence of delay and method of incorporating the delay and its impact into the schedule as they are encountered.

6.1 Each time impact analysis shall demonstrate estimated time impact based on events of delay, date of change order/modifications, proceed order, or unilateral change order/modification given to the Contractor, status of construction at that point in time, and event time computation of activities affected by change or delay. Event times used in analysis shall be those included in latest version of the current CPM contract schedule, in effect at time change or delay was encountered.

6.2 Submit each time impact analysis in triplicate, within ten days after a delay occurs. If the Contractor does not submit a time impact analysis for a specific change order/modification or delay within specified period of time, the Contractor will be deemed to have irrevocably waived rights to additional time and cost.

6.3 Because float time within current CPM contract schedule is jointly owned, it is acknowledged and agreed by the Contractor that the County caused delays on the project may be offset by County caused time savings (including, but not limited to: critical path submittals returned in less time than allowed for the contract, acceptance of substitution requests which result in a savings of time along the critical path for the Contractor, etc.). In such an event, the Contractor will not be entitled to receive an extension of time or delay damages until the County caused time savings are exceeded and contract completion data also exceeded.

6.4 The County will accept or reject each time impact analysis. Upon acceptance, a copy of a time impact analysis signed by the County will be returned to the Contractor for incorporation into the schedule.

6.5 Upon mutual agreement by both parties, incorporate fragnets illustrating the influence of change orders/modifications and delays into the current CPM contract schedule during first update after agreement is reached.

6.6 In the event the Contractor does not agree with the decision of the County regarding impact of a change or delay, the County's determination shall govern.

7. The Contractor shall resolve out-of-sequence progress, if any, to provide the actual construction sequence to calculate the current critical path(s) and identify any deviations of interim milestones and/or project completion.

8. As-built schedule – Submit as-built schedule covering work performed under the Contract within 30 days after final completion. As-built schedule – Certified by a planner/scheduler and Contractor's project manager as being the manner in which Contract was executed. Submittal and acceptance of the schedule will be a condition precedent to reduction/release of retainage at the end of the contract.

9. Schedule reviews – The County will review and respond to scheduling submittals within 14 days after submittal, unless a different review period is specified in this section. Submit a revised schedule within seven days after receipt of the County's response if the County requires changes or additional information.

10. Early completion schedule – If the schedule duration proposed by the Contractor is less than the completion date in the NTP, the proposed schedule will not nullify the Contractor's right to the NTP duration. The Contractor agrees that in the event a proposed early completion schedule (or any subsequent update) which is found to be acceptable by the County, indicating a duration which is less than time allowed by Contract for completion of work or of interim milestone, Contract completion time shall only be shortened by a change order/modification to equal Contractor's proposed baseline CPM contract schedule duration.

    If the schedule duration proposed by the Contractor is less than the completion date in the NTP, the proposed schedule will not nullify the Contractor's right to the NTP duration.

11. Three week rolling bar chart schedule – Once a week, on a day mutually agreed to by the County and the Contractor, a meeting will be held to assess the progress achieved by the Contractor during previous work week. Submit a project schedule listing activities completed and in progress for the previous week and the activities scheduled for the succeeding two weeks based on the current CPM contract schedule. The three week rolling bar chart schedule shall be provided from the current CPM contract schedule and include all activities scheduled including: activity ID, description, early start and early finish, total float, original duration, remaining duration, percent complete, performance of the activity, and pertinent remarks as to activity status. The schedule shall be submitted to the County before the weekly meeting for review. Submit copies of schedule on 11-inch by 17-inch paper.

12. Monthly Updated Current Contract Schedule

    a. One computer generated backup copy of monthly updated current CPM contract schedule file.

    b. Written narrative for updated current CPM contract schedule.

13. Fragnets

    a. One computer generated backup copy of fragnet files.

    b. Written narrative of fragnet assumptions.

14. Contract Time Scaled Network Diagrams – Submit computer generated time-scaled network diagram entitled "Current Time Scaled Network Diagram" with submittal of items referenced below.

    a. Submit with initial early work schedule submittal.

    b. Submit every month with updated current CPM contract schedule.

15. Written Narrative Reports – Include a stand alone narrative of sufficient detail to explain basis of Contractor's submittal with each schedule submittal.

    15.1 CPM Contract Schedule Submittals – Explain determination of activity durations and describe Contractor's approach for meeting required interim and final completion milestone dates, as specified in the Contract. Include as a minimum basis and assumptions used in preparing the submittal, including crew sizes, equipment requirements, and anticipated delivery dates; restraints; critical path activities; production rates; activities requiring overtime or additional shifts; activities that contain time contingencies for impacts to be expected from normal rainfall; holidays and other non-work days; potential problem areas; permits; coordination required with the County; utilities and other parties; and long lead delivery items requiring more than 30 days from order to delivery. Identify work items that may be expedited by use of overtime or additional shifts. Identify and explain sequencing and other constraints such as manpower, material, and equipment. Include listing of holidays and special non-work days.

    15.2 Current CPM Contract Schedule Submittals – State in narrative, work actually completed and reflect progress along critical path in terms of days ahead of or behind allowable dates. Specific requirements of narrative are as follows:

15.2.1 If updated current CPM contract schedule indicates an actual or potential delay to contract completion date or interim milestone dates as specified under the contract documents or modified by change order/modification, identify causes of delays, disruptions and interruptions and provide explanation of work affected and proposed corrective action to meet milestone dates involved or to mitigate potential delays or disruptions. Document and log in a matrix format activities with non-mitigated negative float until the negative float is mitigated. Identify deviations from previous month's critical path. The matrix will include applicable activity number, description, planned start and finish dates, current start and finish dates, and float quantity.

15.2.2 Identify by activity number and description, activities in progress and which activities are scheduled to complete during the next period.

15.2.3 Identify by activity number and description, activities to be started during the month following the report period. Show Contractor's forecast early and late start, and finish dates.

15.2.4 Discuss added change order/modification work items.

3. EXECUTION

3.1 Baseline CPM Contract Schedule

3.1.1 Provide Contractor's detailed activities and sequencing for work included in the contract. Assign unique activity identification for each detailed activity.

3.1.2 Indicate Contractor's best estimate for original durations, early dates, late dates, logic ties, constraint dates, and total float. Schedule activities in the sequence which Contractor intends to perform work.

3.1.3 Include following activity sequence for major material and equipment procurement:

3.1.3.1 Submittal preparation; review for acceptance; and fabricate/deliver – Divide procurement items that may contain multiple submittals occurring at different time intervals into separate sequences that can be tracked

on individual basis. Include a maximum original duration of 20 working days for re-review. Resubmittal activities shall contain submittal preparation activities for other material and equipment procurement (non-major) to schedule.

3.1.4 Baseline CPM contract schedule activity requirement are as follows:

3.1.4.1 Activity descriptions – Briefly convey scope and location of work indicated.

3.1.4.2 Activities – Discrete items of work accomplished under contract that provide measurable and recognizable parts of work.

3.1.4.3 Include as contract deliverables, submittal and approval of permit applications and variances, samples of materials, shop drawings, working drawings, inspection and test plans, safety and security plans, and site traffic control plans. Include activities of the County that may affect progress as well as those of affected utility companies and other similarly involved third parties. Include activities in the baseline CPM contract schedule as stipulated in general requirements.

3.1.4.4 Work activities – Show duration in work days.

3.1.4.5 Work activities – Durations of 10 working days or less except for non-construction activities such as procurement of materials, or fabrication of equipment. Should a work activity require more than 10 working days, subdivide work activity to define appropriate work items.

3.1.4.6 Critical path is defined as the sequence(s) of activities with the least amount of float.

3.1.4.7 Failure to include any element of work required for performance of the contract in baseline CPM contract schedule will not excuse Contractor from completing work required to achieve milestone completion, notwithstanding acceptance of baseline CPM contract schedule submittals.

Activities that are susceptible to weather delays caused by rain shall contain time contingencies for those potential delays. The time contingencies shall be described in the appropriate activity log windows of scheduling software. In scheduling the work, Contractor shall plan for normal rainfall (including its subsequent effects on days following extremely heavy rain).

3.2 Baseline CPM Contract Schedule Changes

When commencing new work associated with a change order/modification, incorporate work into the current baseline CPM contract schedule submittal as new activities after discussion with the County concerning how changes will be placed into the revised baseline CPM contract schedule. After an official change order/modification has been issued for work, add it to the schedule.

3.3 Fragnets

3.3.1 Submit revised current CPM contract schedule within 14 days of request. If Contractor falls behind in prosecution of work, as indicated by negative critical path, or submittal of current CPM contract schedule no longer appears to represent actual prosecution of work.

3.3.2 Properly connect to and constrain by, previously existing predecessor and successor activities, as applicable, activities of revised portion(s) of schedule. Band impacted activities in separate networks (fragnets); indicating specific delay or impact issues and submit to the County for review. Combine approved fragnets into current CPM contract schedule.

3.3.3 Time extensions will be granted only to the extent that equitable time adjustments for activity or activities affected exceed total or remaining float along critical path of activities at time of actual delay, or at time a change order/modification was issued. Float or slack time is not for the exclusive use or benefit of the Contractor but is an expiring resource available to all parties as needed to meet contract milestones and contract completion date. Time extensions will not be granted nor delay damages paid until delay occurs:

3.3.3.1 Which is beyond the control and without the fault or negligence of the Contractor and its subcontractors or suppliers, at any tier; and

3.3.3.2 Which extends actual performance of work beyond applicable current Contract completion date and most

recent date predicted for completion of project on approved schedule update, current as of time of the delay or as of time of issuance of a change order/modification.

3.4 Submittal of Schedule

3.4.1 Contractor shall submit the construction schedule within ten (10) calendar days, per Section 00 01 00, Paragraph 1.14e, after receipt of the Notice to Proceed (NTP) on hard copies and CD that is compatible with P6. The Contractor shall provide to the County for review four (4) copies of the construction schedule indicating the sequence of operations, description of the work, calendar definition and duration showing entire job performed within the specified contract time.

3.4.2 If the schedule duration proposed by the Contractor is less than the completion date in the NTP, the proposed schedule will not nullify the Contractor's right to the NTP duration.

3.4.3 The County shall review the Contractor's construction schedule. The Contractor shall incorporate all the revisions requested by the County and submit the final schedule within seven (7) calendar days of its receipt from the County.

3.4.4 The schedule of values shall be prepared and submitted together with the construction schedule.

3.4.5 Failure to meet these requirements may result in a determination and recommendation that the Board of Supervisors determine that the successful bidder as non-responsible because such failure reflects the bidder's ability to manage the work.

3.4.6 The schedule shall be revised at no additional cost to the County and resubmitted for review when:

3.4.6.1 Changes to contract affect contract completion time.

3.4.6.2 "Slippage" occurs because of procurement delays, rain, strikes and other delays.

3.4.6.3 Any activities are modified from previous submittal.

3.4.6.4 Delay on initial non-critical items is of such magnitude as to change the critical path.

3.5 Responsibility for Completion

The Contractor shall furnish sufficient forces, offices, facilities and equipment, and shall work such hours including night shift and overtime operations, as necessary to ensue the prosecution of the work in accordance with the current monthly construction schedule update. If, in the opinion of the County, the Contractor falls behind in meeting the construction schedule as presented in the current monthly schedule update, the Contractor shall take such steps as may be necessary to improve its progress, and the County may require it to increase the hours of work, the number of shifts, overtime operations and/or the amount of construction plant and equipment without additional cost to the County.

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.

2. Periodic construction photographs.

B. Related Sections include the following:

1. Division 1 Section, Submittal Procedures, for submitting photographic documentation.

2. Division 1 Section, Closeout Procedures, for submitting digital media as Project Record Documents at project closeout.

PART 2 – PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 – EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one set of images on CD-ROM in the field office at project site, available at all times for reference. Identify images same as for those submitted to Architect and Construction Manager.

C. Preconstruction Photographs: Before commencement of demolition, or commencement of construction, take digital photographs of project site and surrounding properties, including existing items to remain during construction, from different vantage points.

D. Periodic Construction Photographs: Take digital photographs weekly, with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Architect or Construction Manager Directed Construction Photographs: From time to time, Architect or Construction Manager may instruct photographer about number and frequency of photographs and subject, general directions or vantage points for photographs. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures
B. Construction Progress Schedules
C. Shop Drawings
D. Product Data
E. Samples
F. Manufacturers' Instructions
G. Manufacturers' Certificates
H. Coordinated Drawings
I. Request for Information
J. Contractor's Photographs

1.02 SUBMITTALS LIST AND SCHEDULE

A. Submittal: Within 30 days or submission of List of Submittals, whichever is later, after award of contract, and before submitting items for review, submit two copies of submittals list and schedule.

B. The Contractor will submit and document all submittals as directed by the County Project Manager.

C. Schedule: Compile complete schedule of submittals anticipated to be made during progress of work.

1. Include list of each type item for which Contractor's drawings, shop drawings, coordination drawings, product data, samples, certificates of compliance, manufacturer's certificates, warranties, and other types of submittals are required. Include number of Contractor's drawings, shop drawings, and coordination drawings anticipated within each submittal.

2. Sequentially number each submittal. Use original submittal number with sequentially numbered suffix for resubmittals.

3. Allow at least 10 working days, average, for Architect's review of submittals following receipt of submittal, including return to Contractor.

4. Indicate date of submittal by Contractor to Architect and date of receipt of reviewed submittals by Contractor from Architect.

5. Coordinate schedule with subcontractors and materials suppliers.

6. On acceptance by Architect, adhere to schedule except when specifically otherwise permitted. Accurately maintain submittal log for duration of contract.

D. Revisions: Revisions to original submittal list and schedule will only be accepted by the County Project Manager when revisions are required by circumstances not reasonably anticipated by Contractor during preparation of original schedule.

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal directly to Architect and copy the County Project Manager on the transmittal.

1. Bind submittals sturdily, neatly label covers.
2. Include job number as it appears on Contract Documents.
3. Include state agency application or approval number.
4. When requested by the County, all submittals shall be submitted by pdf. File.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Architect, Contractor, Subcontractor or supplier, manufacturer; pertinent Drawing Sheet and detail number(s) and specification Section number, as appropriate.

1. Provide name and telephone number of individual who may be contacted for further information.

D. Apply Contractor's stamp with Contractor's original signature or initials affixed thereto, certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents. Stamped signatures or initials are acceptable.

E. Schedule submittals to expedite the project. Coordinate submission of related items.

1. Make all submittals in accordance with the progress schedule and far enough in advance of scheduled dates of installation to provide required time for reviews for securing necessary approvals for possible revision and submittal and for placing orders and securing delivery.

F. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.

1. Requests for deviations from Contract Documents shall be submitted for consideration before submittal of affected items. Submit in accordance with substitution requirements of Section 01 65 00 Transport, Handling and Storage. Only deviations which have been previously accepted in writing shall be included in submittals.

G. Provide space for Contractor and Architect review stamps.

H. Revise and resubmit submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

I. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.

J. Coordinate as required with all trades and all public agencies involved.

K. Unless otherwise specifically authorized by Architect, make all submittals in groups containing all associated items. Architect may reject partial submittals as not comply with the provisions of this Section.

L. Resubmittals:

1. Subject to same terms and conditions as original submittal.

2. The County Project Manager will accept not more than one resubmittal.

a. Should additional resubmittals be required, Contractor shall reimburse County for Architect's account for time spent in processing additional resubmittals at rate of

2.5 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Architect's personnel engaged or Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance sick leave, holidays, vacations, pensions, and similar contributions and benefits.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. Submit as required in Section 01 32 00.

1.05 SHOP DRAWINGS

A. Submit a schedule of the shop drawings, listing their required submission and review dates to the County Project Manager for approval. The submission time shall be in accordance with the requirements set forth in Section 1.02, Submittals List and Schedule, Paragraph A. The schedule shall allow sufficient time for checking by the Architect. In addition, the shop drawing submission and review dates shall be incorporated into the progress schedule required in the General Conditions.

1. "Elapsed time due to 'Revise and Resubmit' or 'Not Approved' action, indicated, on submittal review (due to inaccurate data or incomplete definition), shall not adversely affect equipment delivery and/or installation schedules".

2. "Allotted time for review/approval process shall be a minimum of ten (10) working days from the date individual submittals are received by the Architect.

B. Submit newly prepared information, drawn to accurate scale. Highlight, encircle or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as to the basis of Shop Drawings. Standard information prepared without specific reference to the Project will not be approved as Shop Drawings.

C. Shop Drawings shall include fabrications and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions
2. Identification of products and materials included.

3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.

D. Sheet Size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 inch x 11 inch, but not larger than 30 inch x 42 inch.

E. The Contractor shall review, stamp with his approval as herein required, and submit with reasonable promptness and in orderly sequences, in accordance with the submittal schedule. All shop drawings required by the Contract Documents or subsequently by the Architect as covered by modifications shall be properly identified. At the time of submission the Contractor shall inform the Architect in writing of any deviation in the shop drawings.

F. Stamp: Each page of shop drawings shall bear the Contractor's stamp, which shall signify the Contractor's representation that he has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained in the shop drawings, all in accordance with the requirements of Section 01 33 00 Submittals. Each stamp shall be accompanied by a wet signature or initial of an employee of the Contractor who may be contacted for information. Stamped signatures or initials are not acceptable.

G. Submittals not certified by being stamped and signed will be returned without action as well as those, in the Architect's opinion, that have not been adequately reviewed or coordinated by the Contractor.

H. Method of Review: Submit shop drawings, electronically as a pdf file using as directed by the County Project Manager. Comments or corrections will be noted on the shop drawings and returned to the Contractor, who shall identify all changes made since the previous submittal and resubmit in the same manner. After it is reviewed by the Architect, the shop drawings will be stamped and returned to the Contractor who shall make distribution of copies as required.

I. The Architect will review and approve shop drawings with reasonable promptness so as not to cause any delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. The Architect's approval of a separate item shall not indicate approval of an assembly in which the item functions.

1. Contractor shall allow additional time if processing must be delayed to permit coordination with subsequent submittals.

J. Submittal of shop drawings to the Architect shall be made by the Contractor with a dated transmittal form or letter, and not by subcontractors or suppliers.

K. The Architect's approval of shop drawings shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation, nor shall the Architect's approval relieve the Contractor from responsibility for errors or omissions in the shop drawings.

1. Notations by the Architect which increase contract or time of completion shall be brought to County Project Manager's attention and authorization by the County shall be obtained before proceeding with work.

L. No portion of work requiring shop drawings shall be commenced until the shop drawings have been approved by the Architect.

M. SHOP DRAWING PROCESSING

1. Requirements for Submittal of Shop Drawings

a. Shop drawings shall be submitted directly to the Architect and copy of transmittal to the County Project Manager.

2. Each shop drawing submitted for review shall have the following information:

a. Project Name
b. Specs. No.
c. Contract No.
d. Technical Specifications Section No.

3. Each item of the submittal must be referenced to the proper item of the specification or drawings.

4. A signed statement from the General Contractor stating that the submittal has been reviewed by him and that it conforms with the drawings and specifications.

5. Provide a copy of each transmittal to the County Project Manager and Inspector.

6. Types of Approvals

   a. “No Exception Taken” (Approved). This stamp will be used by the Architect for accepted shop drawings and will qualify the submittal for shop drawing number.

   b. “Exception Noted” (Approved as Noted). This stamp will be used by the Architect when minor correction will make the submittal acceptable. These corrections will be shown in red on each of the submittals or on a correction list. This approval will qualify the submittal for a shop drawing number.

   c. “Resubmit” (Rejected). Submittals which do not conform to the drawings and specifications will be returned without stamping or issuance of a shop drawing number. The rejection transmittal will state why the submittal was not acceptable and request that it be resubmitted.

N. Assignment of Shop Drawings Numbers

Each accepted submittal shall be stamped by the Architect and assigned a shop drawing number using either of the following systems. The shop drawing number will be shown on each sheet that is stamped by Architect.

1. A simple numerical sequence may be used whereby each submittal is assigned a number in order of approval (SD-1, SD 2…).

2. A numerical sequence by classification may be used such as SD-S-1 for a Structural Submittal; SD-AC-1 for an Air Conditioning Submittal; SD-C-1 for a Civil Submittal, SD-L-1 for a Landscape Submittal; SD-A-1 for an Architectural Submittal; and SD-X-1 for Miscellaneous Submittals.

3. Material submittals and paint color chips should be assigned a shop drawing number for identification purposes.

O. Transmittal of Submittals

The General Contractor shall submit to the Architect a set of shop drawings which comply with this Exhibit. Upon receipt of the submittal, the Architect will review or have his consultants review the submittal for compliance with the drawings and specifications.

P. Processing

1. Procedure

a. Shop drawings will be stamped or returned as per Section M of this Exhibit. Accepted and numbered shop drawings shall be returned to the General Contractor. The Architect will provide a pdf copy of approved shop drawings to the County Project Manager, Building Inspector, and Contractor.

b. The County Project Manager is to check shop drawings for any deviation from the drawings or specifications prior to releasing them to the Contractor. If there are discrepancies is in the shop drawings, they should be sent back to the Architect for correction.

1.06 PRODUCT DATA

A. Submit pdf copy of product data using as directed by the County Project Manager.

B. Product data shall identify applicable products, models, options and other available data specific to the project requirements.

C. After review and approval by the Architect, copies will be distributed to the County Project Manager, Building Inspector, and General Contractor. The approved product data sheets shall be retained at the site by the General Contractor to be used for reference.

1.07 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the product with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Unless precisely specified, submit samples of finishes from the full range of manufacturers' standard colors, textures and patterns for Architect selection, or in custom colors selected.

C. Include identification on each sample with full Project information, as required for Shop Drawings, Item, 1.04 above.

D. Submit a minimum of three (3) samples or as specified in individual sections of the specifications, two of which will be retained by the Architect.

E. Reviewed samples which may be used in the work are indicated in individual specification sections.

F. Approval or rejection of samples will be made by the Architect in writing.

1.08 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

1.09 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification sections, submit manufacturers' certificate to Architect for review in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

1.10 COORDINATED DRAWINGS

A. Submit drawings which indicate routing, locations, sizes, types and numbers of components in concealed spaces where potential conflict may occur between structures, mechanical, electrical, fire sprinklers, communications and ceiling suspension systems.

B. Indicate locations of all ceiling penetrations and surface-mounted items. Provide cross sections at all areas to indicate proper support of ceilings and non-interference with work of other sections of the specifications. Cross sections shall indicate coordination required and proposed solutions for routing of elements where potential conflict exists. A reproduction of Architect's reflected ceiling plan is not acceptable.

C. Drawings shall be based on field measurements, shop drawings and product data.

D. Conflicts shall be brought to the County Project Manager's attention immediately.

E. Submit to the Architect, in writing, requests for clarification or interpretations that will affect the intent of the Contract Documents.

F. The coordinated drawings shall indicate each class of work in the affected area. The drawing or written submittal shall include Contractor's recommendations for the solution of any potential conflicts as well as recommendations tendered by any work of any section of the specifications which may be affected thereby.

G. Submit the coordinated drawings in a scale of not less than 1/8" – 1' – 0" with necessary sections and profiles at an appropriate, clearly readable enlarged scale. Submit the coordinated drawings as one reproducible and two blue-line prints as a pdf file using as directed by the County Project Manager.

H. The Architect will review the submittals, make appropriate notations and comments to ensure the solution meets the intent of the Contract Documents and then return to Contractor for implementation.

I. The Contractor shall be responsible for the proper coordination of the work of all sections of the specifications in the execution of coordinated drawing. Any installation of materials, components or equipment under one section of the specifications without full and complete agreement, knowledge and consent by fabricators of adjacent or otherwise related or affected work will not be approved.

J. It shall be incumbent upon the Contractor that all fabricators of work involved in the execution of coordinated drawings be informed, consulted and advised in sufficient advance time to arrive at solutions where no extension of contract time or extra cost to the

County will be approved due to Contractor's negligence in the expeditious, timely submittal of coordinated drawings.

1.11 REQUEST FOR INFORMATION

A. Submit Request for Information (RFI) or interpretation in writing to the County.

B. Response will be in writing, by the County, either in the construction field meeting notes or on the RFI itself, within 5 working days of receipt of RFI.

1. No change in cost interpretations or clarifications will be accepted as such.

2. Change in cost interpretation or clarifications will institute a Change Order procedure.

1.12 CONSTRUCTION PHOTOGRAPHS

A. Submit with payment request monthly. See Section 01 32 33.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

* * * * *

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Submittals

1. Shop drawings.

2. Product or catalog data.

3. Samples.

B. The Contractor will prepare and submit shop drawings as directed by the County Project Manager.

C. Related work specified elsewhere.

1. Operating and maintenance manuals.

2. Spare parts or hardware lists.

3. Tests and certificates.

1.02 DEFINITIONS

A. Shop Drawings

1. Original drawings prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the work; showing fabrication, layout, setting or erection details.

2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.

B. Product or Catalog Data

1. Manufacturers standard drawings modified to delete nonapplicable data or include applicable data.

2. Manufacturers catalog sheets, brochures, diagrams, schedules, charts, illustrations or other descriptive data. Mark each copy to identify pertinent dimensions, materials, products or models.

C. Samples

1. Physical examples to illustrate materials, equipment or workmanship.

2. Office samples to show functional characteristics of product or material. Submit with full range of colors available.

3. Field samples and mock-up; erect at site in location acceptable to Project Manager.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Prior to Submittal

1. Review and approve Shop Drawings, Product Data and Samples prior to submission to the Department.

2. Coordinate each submittal with work of the project and Contract Documents so as to cause no delays in the work.

3. By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.

4. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Department's acceptance unless the Contractor has specifically informed the Department in writing of such deviation at the time of submission and the Department has given written acceptance to the specific deviation.

5. Contractor's responsibility for errors and omissions in submittals or deviations from Contract Documents is not relieved by the Department's review of submittals.

6. The Contractor shall direct specific attention, in writing or on submitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Department on previous submittals.

B. After Submittal

1. Begin no work which requires submittals until return of such submittals with the Department's stamp and signature indicating review.

2. Distribute copies of submittals to subcontractors, suppliers or manufacturers as their interests appear.

1.04 IDENTIFICATION OF DATA

A. All submittals for review shall have the following identification data, as applicable, contained thereon or permanently adhered to.

1. Project Name and Location

2. Specifications Number

3. Subcontractor's, Vendor's, and/or Manufacturer's Name, Address and Phone Number

4. Product Identification

5. Shop Drawing Title, Contractor's Drawing Number, and Date of Drawing and Revisions

6. Applicable Contract Drawings and Specifications Section Numbers

7. Contractor's Approval, Signature and Date

B. Submittal Format

Submittal No. _____

Project Name _____

_____

_____

Specifications No. _____

Product _____

Section No. _____

Supplier _____

We have reviewed the submitted, and have verified that it meets the criteria required in accordance with the plans and specifications.

Contractor's Name _____

Signature _____

Title _____

C. Catalog Data

1. Each separate catalog, brochure or single page data sheet submitted shall have the identification required and the Contractor's approval.

2. Catalogs or brochures containing multiple items for review need identification only on the cover. Identify page numbers and catalog items.

3. In the event that one or more of the multiple items are not accepted in any submittal, additional copies required will not be required until all items are accepted.

4. Provide a space approximately 4" x 4" for the Department to affix its status stamp.

1.05 COLOR AND FINISH SELECTION

A. Contractor Submittals

1. Submit as soon as practical, subsequent to award of contract, names of manufacturers and pertinent products or materials proposed for use in which a color selection is required.

2. Submit standard color charts or samples as requested by the District. All items for color selection must be submitted prior to issuance of any approvals.

3. Contractor is responsible for submitting products that comply with technical specifications.

1.06 SUBMISSION REQUIREMENTS

A. Submit all Shop Drawings, Product or Catalog Data and Samples to the District by transmittal containing identification of project, specifications number and identification of items being submitted.

B. Product Data

1. Original Submittal – Six (6) copies of all Shop Drawings and/or Product Data for review in ample time to coordinate necessary features of construction with all fabrication and installation requirements.

2. Resubmittal – When required, copies will be returned to Contractor. After revision submit new copies as stipulated for original submittal. Indicate all changes.

C. Samples

1. Original Submittal – Furnish three (3) samples, unless otherwise specified, of each item for which samples are required for review. Obtain review prior to delivery of material to project site. Such samples shall be representative of actual material proposed for use in project and of sufficient size to demonstrate design, color, texture, and finish.

2. Resubmittal – All rejected samples will be returned upon request. All resubmittals shall consist of three (3) samples.

1.07 REVIEW AND PROCESSING

A. General

1. The Department will review and accept or take other appropriate action upon Contractor's submittals for conformance with the design concept of the work and with the information given in the Contract Documents. Acceptance of a specific item shall not indicate acceptance of an assembly of which the item is component.

2. Submittals not approved by the Contractor will be returned to Contractor. Submittals will not be reviewed or accepted by the Department or Architect without Contractor's prior approval.

B. Review

1. Product Data – After review, two (2) copies bearing the Department's review stamp and signature will be returned to Contractor.
2. Samples – After review one (1) sample will be returned and the remainder will be retained by the Department until completion of the work.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Tests.

B. Inspections.

C. County will employ and pay for the services of an Independent Testing Laboratory or Soils Engineer to perform specified testing and/or inspections.

D. Related requirements specified elsewhere:

1. Refer to the various trade sections for specific test and inspection requirements.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Los Angeles County Building Code.

B. Uniform Building Code Standards, as applicable.

C. California Code of Regulations.

1. Title 17 and 24.

1.03 QUALITY ASSURANCE

A. General Test Requirements. Materials to be furnished under the Contract are subject to testing and inspection for compliance with requirements of Drawings and Specifications.

B. Testing Laboratory or Agency shall be the licensed Testing Laboratory or Agency meeting the requirements of ASTM E-329, designated by the County and referred to hereafter as the Testing Laboratory. Perform all testing under supervision and control of a California registered professional engineer employed by the Testing Laboratory.

C. Soils or Foundation Engineer will be the registered professional Geotechnical Engineer employed and paid by the County.

D. Disqualified Material. Any material shipped or delivered to the site by the

Contractor from the source of supply prior to having satisfactorily passed the required testing and inspection, or prior to the receipt of a notice from the County or Architect that such testing and inspection will not be required, shall not be incorporated in the Work.

1.04 QUALITY CONTROL

A. Earthwork.

1. Approval of fill material.

2. Compaction tests.

3. Inspection of subgrades and excavations.

B. Concrete.

1. Materials.

a. Portland cement tests.

b. Concrete aggregates.

c. Reinforcing bars.

2. Concrete quality.

a. Concrete mix designs.

b. Strength tests of concrete.

3. Concrete inspection.

a. Job site inspection.

b. Batch plant or weighmaster inspection.

C. Masonry.

1. Materials.

a. Tests of brick or block masonry units.

b. Tests of mortar and grout materials.

c. Reinforcing steel bars.

2. Mortar and grout quality.

a. Strength tests for mortar and grout

3. Masonry inspection.

a. Job site inspection.

D. Structural steel and metal deck tests and inspections.

1. Materials.

a. Material identification and certification.

b. Testing of unidentified material.

2. Inspection of structural steel, light gage steel deck and welding.

a. Welding inspection (shop and field).

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials to be tested and/or inspected as specified in respective sections.

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work.

1. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Furnish copies of products test reports as required.

D. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

E. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse County for laboratory personnel and travel expenses incurred due to Contractor's negligence.

F. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

3.02 FIELD QUALITY CONTROL

A. Tests.

1. County will select an independent testing laboratory to conduct tests. Selection of material required to be tested shall be by the laboratory or County's representative and not by Contractor.

2. Contractor shall notify County in sufficient time in advance of manufacture of material to be supplied, which must by terms of the contract be tested, in order that the County may arrange for testing.

3. County will select and pay testing laboratory costs for all tests and inspection, except as provided elsewhere in this section.

B. Test reports.

1. One copy of all test reports shall be forwarded to the County by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Sample taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of (Title 24) and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or

not the material or materials tested comply with requirements.

C. Verification of test reports.

1. Each testing laboratory shall submit to the County a verified report in duplicate covering all of the tests which were required to be by that laboratory during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.

D. Inspection.

1. The County shall at all times have access for the purpose of the inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

2. The County shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the County. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the County may correct same and charge the expense to the Contractor.

3. Should it be considered necessary or advisable by the County at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

4. Reimbursement of Inspection Costs. Contractor shall reimburse the County all or any part, of the actual excessive inspection costs incurred by the County due to any or all of the following.

   a. Contractor's failure to complete the Work within the Contract Time and any previously authorized extensions thereof.

b. Claims between separate contractors.

c. Covering of any of the Work before the required inspections or tests are performed.

d. Extra inspections required for Contractor's correction of defective Work.

E. Inspector.

1. An Inspector employed by the County will be assigned to the Work.

2. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

* * *

SECTION 01 50 00

TEMPORARY FACILITIES

1 - GENERAL

1.01 DESCRIPTION

1.02 Field Office and Sheds
1.03 Temporary Utilities
1.04 Staging (Laydown) Area(s)
1.05 Parking
1.06 Sanitary Facilities
1.07 Temporary Barriers and Enclosures
1.08 Temporary Environmental Controls
1.09 Construction signboards

1.02 FIELD OFFICES AND SHEDS

In addition to contractor's field office, the contractor shall provide and maintain during the construction phase, a watertight and secure office of not less than 600 square feet on the premises, if space within staging area is available, or in an existing building located adjacent or nearby (within a block) the site, for use by the County, to include one (1) conference room, one (1) private office not less than 100 square feet. Provide a conference table 36"x 96". Office shall be painted, heated/air conditioned, provided with operating screened windows doors with locks, one 5'-0 wide desk with drawers and chairs,. Contractor shall also provide hot and cold water dispenser with 5-gallon portable water supply (Arrowhead or natural-spring water approved equal), minimum 5 bottles per month and all new equipment, supplies (including office supplies, toilet paper, paper towels, soap, paper cups) and services as mentioned below. All required utilities including but not limited to water, power, telecommunications, shall be arranged for and paid for by the contractor during the construction period.

1.03 TEMPORARY UTILITIES

The contractor shall arrange for and provide all utility services necessary to perform the work, including electricity, fire protection, fuel oil, heating, cooling and ventilating, lighting, natural-gas, telecommunications, internet access and water. Any motors that may be permitted to be connected to any existing County's electrical circuits shall not exceed 1/3 horsepower. Contractor shall provide, maintain and remove upon completion of work, all temporary connecting lines to sources of supplies, and temporary meters and accessories, as needed.

The contractor shall bear all expenses involved in providing and connecting all temporary utility services. The County will assume payment for utility service charges at the time the various permanent meters are set and the County has assumed beneficial occupancy of the facility or accepted the Project, whichever occurs first. Refer to Project General Requirements Section for permanent utility services.

1.04 STAGING (LAYDOWN) AREA(S)

If contractor deems there is sufficient space within property limits to locate the staging (laydown) area, and the temporary offices and sheds, he may do so. If additional space is required by the contractor, the contractor shall procure it offsite at his own expense.

1.05 PARKING

Four (4) parking spaces shall be provided for County's use. If the contractor deems there is sufficient space within the property limits to locate the required parking, no additional parking will be required. However, if there is no sufficient parking at the site for the contractor to perform his operations efficiently, contractor shall secure additional parking offsite, at his own expense.

1.06 SANITARY FACILITIES

Contractor shall install and maintain in a sanitary condition, suitable chemical toilets for use by workmen. Toilets shall be in a location approved by the Department. There shall be a minimum of one (1) toilet for each multiple of twenty (20) contractor employees, or fractional part thereof, working at the job site. The temporary restroom facilities shall be serviced daily.

1.07 TEMPORARY BARRIERS AND ENCLOSURES

1. The contractor shall provide and maintain during the construction period, a 6 ft. high chain link fence with gate(s) around the construction area(s) consisting of 11 gauge (minimum) x 2" mesh chain link fabric attached to steel pipes and suitable base, spaced at 10 feet on center maximum. Provide top and bottom tension wires and corner post bracing. Provide chain link gates with welded steel pipe frames and all hardware required for proper operation. Fencing shall not have any loose or easy to remove tie wires, hog rings, etc. Base shall be properly secured to avoid overturning during high winds, etc.

2. Provide and maintain the Department specified chain link fence enclosures around each jobsite with vehicle and man gates as required.

3. Obtain and pay for all required permits and inspections. Construct in accordance with applicable codes and regulations of public agencies having jurisdiction.

1.08 TEMPORARY ENVIRONMENTAL CONTROLS

The building structure and interior finish and furnishings shall be protected from rain, dew, wind, and all other elements of the weather during periods when roof areas are unprotected by roofing or when breaches are present in exterior walls. Such areas shall be covered with weather-tight tarpaulins or roofing materials firmly secured or by other approved methods. Refer to General Conditions. When, in the opinion of the County, breaches in roof or wall areas afford access to unauthorized persons, the contractor shall, at no additional expense to the Department, construct at such breaches, substantial barricades of type and material as approved by the Department.

1.09 CONSTRUCTION SIGNBOARDS

Refer to article entitled "Advertising" of the General Conditions. Prior to any ground breaking operation or in the case ground breaking is not required, within ten (10) days after award of contract, the Contractor shall furnish and erect two (2) identification signboards 4'-0 x 8'-0 in size, constructed of 3/4" exterior grade plywood within a frame, supported on posts, and adequately braced to resist wind stresses. The sign background shall be painted with two (2) coats of exterior type paint over a suitable primer and lettered with block letters professionally applied. The signboard shall set forth, in sequence, the following information with the layout as directed by the Department.

PATHWAY TORRANCE COMMUNITY HEALTH AND WELLNESS CENTER RENOVATION PROJECT
County of Los Angeles
Board of Supervisors

Hilda L. Solis	1st District
Holly J. Mitchell	2nd District
Lindsey P. Horvath	3rd District
Janice Hahn	4th District
Kathryn Barger	5th District

Fesia Davenport, Chief Executive Officer, Chief Executive Office
Mark Pestrella, Director, Department of Public Works

La Canada Design Group, Architect
Name of Contractor

In addition, individual signs of Contractors, subcontractors and materialmen may be displayed as approved.

Signs shall be promptly removed by the Contractor or by the owner, if individually owned, upon completion of the work. The size, construction, subject matter and location of all signs shall be subject to the approval of the Department.

* * *

SECTION 01 57 00

STORM WATER POLLUTION PREVENTION

PART 1 – GENERAL

1.1 Storm Water Pollution Prevention Plan (SWPPP).

Storm Water Pollution Prevention Plan is used if the project disturbs one (1) acre or more of soil and conforms to Risk Level 2.

1.1.1 Terms and Definitions.

1. **Active Areas of Construction –** are all areas subject to land surface disturbance activities related to the Project including, but not limited to, the Project site, staging areas, immediate access areas, and storage areas. Previously active areas will be considered active areas until temporary or final soil stabilization BMPs are implemented.

2. **Accumulated Precipitation Procedure (APP) –** the methods and procedures for management and discharge of accumulated precipitation on the Project site. A copy of the APP template is included as Exhibit E in Section E.3 of the Special Provision.

3. **Agency-Certified SWPPP** – a SWPPP that has been reviewed and certified by the Agency.

4. **Best Management Practices (BMPs) –** Temporary construction practices listed in table 1.1.5 (A), and identified in the California Stormwater Quality Association (CASQA) Construction BMP Handbook.

5. **BMP Handbook** – The edition of the Californi Stormwater Quality Association (CASQA) Construction BMP Handbook, in effect as of the date of advertisement of the Contract.

6. **BMP Checklist** – the LACPW BMP Checklist included as Exhibit E in Section E.1 of the Special Provisions.

7. **Exposed Soil -** native soil left exposed as the result of uncovering, removal of vegetation or pavement, grading, excavation, or any other construction activity. Soil protected with temporary soil stabilization BMPs will not be considered exposed soil.

8. **Final Stabilization** – the implementation of soil stabilization BMPs following the completion of Work.

9. **Inactive Disturbed Soil Areas (DSA) –** areas that have been disturbed and have not or will not be disturbed for at least 14 Days.

10. **Non-Storm Water Discharges -** discharges that do not originate from precipitation events.
11. **Non-Visible Pollutants** - pollutants associated with a specific Project site or activity that cannot be seen through observation and which can have a negative impact on water quality.

12. **Numeric Action Level (NAL)** - Numeric action level (250 NTU and 6.5-8.5 pH) at which the QSP shall evaluate whether the implemented BMPs are performing effectively or if corrective actions are required.

13. **TMDL Numeric Action Level** - TMDL numeric action levels as listed in Table H-2 of the CGP (Order No. 2022-0057-DWQ). An exceedance occurs on the second, and each subsequent, analytical result for samples taken from any and all discharge location(s) within the same drainage area, during the same reporting year that is above the concentration set forth in an applicable numeric action level.

14. **Passive Treatment** - the application of natural or synthetic chemicals and products to reduce turbidity in discharges through coagulation and flocculation. Passive treatment does not rely on computerized, enclosed systems with pumps, filters, and real-time controls. Passive treatment may include pumps where they are necessary to move water around the construction site. Passive treatment products are available in a variety of forms and may be land-applied for soil stabilization (e.g., bonded fiber matrixes, hydromulches) or water-applied for sediment removal (e.g., liquid treatment chemicals, powders, slow-releasing solid blocks/socks).

15. **Perimeter Sediment Control BMPs** – a temporary sediment control BMP around the perimeter of the Project site used to prevent sediment discharges from storm water run-on or run-off.

16. **Probability of Precipitation (PoP**)- the likelihood, expressed as a percent, of a measurable precipitation event (1/100th of an inch) at a grid point during the indicated valid period.

17. **Qualified SWPPP Developer (QSD)** – an individual certified by the California Stormwater Quality Association (CASQA) as meeting the requirements of Order No. 2022-0057-DWQ to develop, revise, and amend SWPPPs.

18. **Qualified SWPPP Practitioner (QSP)** – an individual certified by the California Stormwater Quality Association (CASQA) as meeting the requirements of Order No. 2022-0057-DWQ.

19. **Qualifying Precipitation Event (QPE)** - any weather pattern that is forecast to have a 50 percent or greater Probability of Precipitation (PoP) and a Quantitative Precipitation Forecast (QPF) of 0.5 inches or more within a 24-

hour period. The event begins with the 24-hour period when 0.5 inches has been forecast and continues on subsequent 24- hour periods when 0.25 inches of precipitation or more is forecast. Qualifying precipitation event forecast information shall be obtained from the National Weather Service Forecast (e.g., by entering the zip code of the Project location at https://forecast.weather.gov).

20. **Quantitative Precipitation Forecast (QPF)** - A spatial and temporal precipitation forecast that will predict the potential amount of future precipitation for a specified region, or area.

21. **Run-On -** storm water discharges that flow onto the Project site.

22. **Run-On Control BMPs -** BMPs used to divert or direct run-on either around or through the Project site.

23. **Surface Water Buffer** – Is a natural buffer and/or equivalent erosion and sediment controls when a water of the U.S., is located within 50 feet of the site's soil disturbances, unless infeasible.

24. **SWPPP Preparation Template -** shall be CASQA Construction BMP Handbook and the SWPPP Template for Traditional Construction Sites for the 2022 Construction Stormwater General Permit.

25. **Total Maximum Daily Load (TMDL)** - is the sum of the maximum amount of a pollutant that a waterbody can receive per day and still meet state water quality standards. It is the sum of the individual Waste Load Allocations (WLAs) for point sources, the load allocations for nonpoint and natural background sources, and the margin of safety.

26. **Turbidity** – The cloudiness of water quantified by the amount light traveling through a water column is scattered by suspended organic and inorganic particles as measured and reported in Nephelometric Turbidity Units (NTU).

1.1.2 Abbreviations.

Abbreviation	Word or Words
APP	Accumulated Precipitation Procedure
BMP	Best Management Practice
CGP	Construction General Permit (Order No. 2022-0057-DWQ)
ELAP	Environmental Laboratory Accreditation Program
NAL	Numeric Action Level
NEL	Numeric Effluent Limitations
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
NOT	Notice of Termination

Abbreviation Word or Words

PoP .....Probability of Precipitation
QPE .....Qualifying Precipitation Event
QPF.....Quantitative Precipitation Forecast
QSD .....Qualified SWPPP Developer
QSP .....Qualified SWPPP Practitioner
RWQCB .....Los Angeles Regional Water Quality Control Board
SMARTS .....Storm Water Multiple Application Reporting and Tracking System
SWPPP .....Storm Water Pollution Prevention Plan
SWRCB.....State Water Resources Control Board
TMDL .....Total Maximum Daily Load
WDID .....Waste Discharge Identification Number

1.1.3 General. The SWPPP shall conform to the requirement in these Special Provisions, the CASQA Construction BMP Handbook and the SWPPP and CSWMP Template for Traditional Construction Sites for the 2022 Construction Stormwater General Permit. The CASQA Construction BMP Handbook is *available* ***by subscription*** at:

http://www.casqa.org

No work having the potential to cause pollution, as determined by Engineer, shall be performed until the SWPPP has been reviewed and certified by the Agency and a Waste Discharge Identification Number (WDID) has been issued by the State Water Resources Control Board (SWRCB) Storm Water Multiple Application Reporting and Tracking System (SMARTS).

1.1.4 Regulatory Agency Requirements. The following permits shall be considered as reference documents:

a) Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2021-0105, NPDES Permit No. CAS004001). Within the City of Long Beach, Order No. 99-060, NPDES Permit No. CAS004004.

b) National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities No. CAS000002, Order No. 2022-0057-DWQ for Risk Level 2.

c) Within the unincorporated areas of the County of Los Angeles, Los Angeles County Code, Chapter 12.80.

1.1.5 Best Management Practices (BMPs).

Note: The following BMPs requirements may be more stringent than what is included in the CASQA Construction BMP Handbook.

a) **Minimum Requirements.** The Contractor shall implement an effective combination of erosion and sediment controls and maintain the appropriate Construction Site BMPs shown in Table 1.1.5 (A). The BMPs shown in this table meet or exceed the Waste Discharge Requirements referenced in 1.1.4.

TABLE 1.1.5 (A)

Construction Site BMPs		
ID	**BMP Name**	**Minimum Requirement**
Temporary Soil Stabilization		
EC-1	Scheduling	**X**
EC-2	Preservation of Existing Vegetation	**X**
EC-3	Hydraulic Mulch	
EC-4	Hydro seeding	
EC-5	Soil Binders(1)	
EC-6	Straw Mulch	
EC-7	Geotextiles & Mats(2)	**X**
EC-8	Wood Mulching	
EC-9	Earth Dikes/Drainage Swales & Ditches	
EC-10	Outlet Protection/Velocity Dissipation Devices	
EC-11	Slope Drains	
EC-12	Stream bank Stabilization	
EC-14	Compost Blankets	
EC-15	Soil Preparation / Roughening	
EC-16	Non-Vegetative Stabilization	
Temporary Sediment Control		
SE-1	Silt Fence	**X**
SE-2	Sediment Basin	
SE-3	Sediment Trap	
SE-4	Check Dam	
SE-5	Fiber Rolls	**X**
SE-6	Gravel Bag Berm	**X**
SE-7	Street Sweeping and Vacuuming	**X**
SE-8	Sandbag Barrier	**X**
SE-10	Storm Drain Inlet Protection	**X**
SE-11	Active Treatment System	
SE-12	Manufactured Linear Sediment Controls	
SE-13	Compost Socks and Berms	
SE-14	Biofilter Bags	
Wind Erosion Control		
WE-1	Wind Erosion Control	**X**

Tracking Control		
TC-1	Stabilized Construction Entrance/Exit	**X**
TC-2	Stabilized Construction Roadway	
TC-3	Entrance/Outlet Tire Wash	
Non-Storm Water Management		
NS-1	Water Conservation Practices	**X**
NS-2	Dewatering Operations(3)	**X**
NS-3	Paving and Grinding Operations	**X**
NS-4	Temporary Stream Crossing	
NS-5	Clear Water Diversion(4)	
NS-6	Illicit Connection/ Discharge	**X**
NS-7	Potable Water/Irrigation	**X**
NS-8	Vehicle Equipment Cleaning	**X**
NS-9	Vehicle Equipment Fueling	**X**
NS-10	Vehicle Equipment Maintenance	**X**
NS-11	Pile Driving Operations	
NS-12	Concrete Curing	
NS-13	Concrete Finishing	
NS-14	Material Over Water	
NS-15	Demolition Adjacent to Water	
NS-16	Temporary Batch Plants	
Waste Management and Material Pollution Control		
WM-1	Material Delivery and Storage	**X**
WM-2	Material Use	**X**
WM-3	Stockpile Management	**X**
WM-4	Spill Prevention and Control	**X**
WM-5	Solid Waste Management	**X**
WM-6	Hazardous Waste Management	**X**
WM-7	Contaminated Soil Management	
WM-8	Concrete Waste Management	**X**
WM-9	Sanitary/Septic Waste Management	**X**
WM-10	Liquid Waste Management	**X**

(1) Soil binders shall not be used within any streambeds or waterbodies or areas that run-off will enter the streambeds or waterbodies, as determined by the Engineer. All soil binders shall be approved by the Engineer prior to use. Flocculants, coagulants, or other similar products shall not be used on the Work, unless approved by the Engineer.

(2) All temporary soil stabilization and temporary sediment control BMPs that contain plant material (including, but not limited to fiber rolls, erosions control blankets/mats, straw, mulch, and seeds mixes) shall be certified weed-free, biodegradable, and approved by the Engineer prior to use. Fiber rolls wrapped in “photodegradable” plastic netting will not be acceptable. If netting is used, it shall be flexible (e.g., “soft” hemp) so that wildlife does not become trapped in the netting.

Additional BMPs may be required as a result of actual field conditions, Contractor activities, or construction operations.

b) **Implementation Requirements.** Implementation shall conform to the requirements on the applicable BMP Fact Sheets and the following:

1) **Temporary Sediment Control**

i) Linear sediment controls shall be placed at appropriate locations along the perimeter of the site.

ii) Linear sediment controls shall be placed along the toe and face of inactive disturbed slopes (within 14 Days of inactivity), and at grade breaks of exposed soil in accordance with Table 1.1.5 (B).

TABLE 1.1.5 (B)

Slope Percentage	Maximum Spacing
≤ 1:20	Per QSD's Direction
1:20 to 1:4	35 feet
> 1:4 to ≤ 1:3	20 feet
> 1:3 to ≤ 1:2	15 feet
> 1:2	10 feet

iii) Stockpiles of soil shall be covered and surrounded by a berm of perimeter sediment controls prior to a Qualifying Precipitation Event and when not in use.

2) **Wind Erosion Control**

i) Wind erosion control BMPs shall be implemented in conformance with the requirements of the jurisdictional air quality regulatory agency.

3) **Tracking Control**

i) Each entrance to, and exit from, the Project site shall be stabilized per TC-1. Traffic entering/exiting the Project site shall be directed so as to only use such stabilized entrances/exits. Mud and/or sediment tracked onto paved surfaces shall be removed by the end of each Day.

4) **Waste Management and Material Pollution Control**

i) Material stockpiles shall be covered and bermed (surrounded by a berm) not when not actively being usedand prior to a Qualifying Precipitation Event.

ii) Stockpiles of temporary asphalt concrete ("cold mix") shall be covered at all times.

iii) Solid waste shall be placed in containers and covered. Solid waste shall not be stockpiled.

iv) Stockpiles shall be removed from roadways at the end of each Day or as directed by the Engineer.

v) The Contractor shall have a minimum of 3 spill response cleanup on the Work site at all times.

vi) Spills and leaks shall be cleaned up within one hour after spillage.

vii) Concrete wast shall be considered as including, but not limited to, slurry, cement, wash waters, additives, or group. Concrete waste shall be contained in a concrete washout bin. At-grade and below-grade washouts are prohibited. There shall be no discharge of concrete washout or waste onto the underlying soil or surrounding areas.

viii) Secondary containment shall be provided for all sanitary facilities. The QSP shall conduct training for construction site staff for routine housekeeping and sanitary waste management BMPs of identified sources of bacteria (e.g., portable toilets, dumpsters, etc.).

ix) Drip pans or absorbent pads shall be used during all vehicle and equipment maintenance, and under all stationary equipment at all times.

x) Demolition materials shall be covered with an impermeable barrier such as, but not limited to, plastic sheeting prior to a Qualifying Precipitation Event to prevent known contaminants from being mobilized. If Contractor is unable to cover demolished material that was not previously investigated or found to be absent of applicable pollutants in reportable quantities shall sample for any non-visible pollutants that may be in stormwater discharges.

1.1.6 Submittals.

a) **General.** The SWPPP shall be prepared in accordance with the SWPPP Template, and submitted within 10 days of issuance of Notice to Proceed Part 1 (NTP1).

b) **Qualified SWPPP Developer (QSD)**. The SWPPP shall be prepared, certified and amended by QSD. A copy of the QSD's certificate shall be included in Appendix I of the SWPPP submittal.

c) **Accumulated Precipitation Prcedure (APP)**. The SWPPP shall include an APP developed in accordance with the Accumulated Precipitation Procedure Template included in Exhibit E, Exhibit E.3.

1.1.7 Agency Review and Certification. The Agency may require corrections and/or revisions and one or mor e re-submittals prior to certification.

The Contractor shall submit a comment response table following the format below. The table shall be submitted with each re-submittal.

Comment No.	Comment	Response
Include the Agency comment number.	Repeat the comment.	Describe action taken to fully address the comment.

The term SWPPP, as used in Subsections 1.1.8 and thereafter, shall mean the SWPPP which has been reviewed by the Agency and includes the signed Legally Responsible Person (LRP) or Authorized Signatory Certification Page. A blank copy of this Certification Page shall be inserted in the SWPPP submittal (after the cover page) is included as Exhibit E (Attachment) at the end of this specification.

Contractor shall submit one electronic copy of the SWPPP in portable document format (pdf) of the SWPPP per 3-8. The pdf shall not exceed a file size of 75 MB.

The Agency will submit the NOI including the SWPPP to the SWRCB. The SWRCB and RWQCB may require revisions. The SWRCB or RWQCB has not established a time frame for review of the SWPPP and issuance of the WDID.

Review and certification by the Agency or regulatory agencies will not relieve the Contractor of the responsibility for the adequacy of the SWPPP nor for full compliance with all applicable Federal, State, and local laws and regulations governing water quality.

The Contractor shall maintain (1) one hard copy of the SWPPP and SWPPP amendments at the Work site. The SWPPP shall be made available to a representative of regulatory agencies upon request. Any requests by the public shall be directed to the Engineer.

1.1.8 SWPPP Amendments and Change of Information (COI). Amendments to the SWPPP shall be prepared and submitted for review and certification to the Agency within 5 Days of a request by the Engineer.

1.1.9 Implementation.

a) **General.** The Contractor shall be responsible for implementation of the SWPPP, all certified amendments, and these specifications from the date of issuance of the Notice to Proceed Part 2 until the Work is completed, and a Notice of Termination has been filed by the Agency. This includes weekends, holidays, non-Working Days, any periods of temporary suspension of the Work, or during any construction moratoriums. The Contractor shall be responsible for ensuring that all subcontractors, suppliers, vendors, or any other persons performing Work on this Contract complies with SWPPP and these specifications.

   Implementation of the SWPPP shall conform to these specifications and the requirements in the CASQA Construction BMP Handbook per 1.1.3.

   If the BMPs selected in the SWPPP do not result in conformance with these specifications, the Contractor shall implement additional BMPs as necessary.

b) **Sign Requirements.** The Contractor shall provide and install a sign at a location, approved by the Engineer, that is viewable and legible by the public from a safe, publicly accessible location. The sign shall include the following information:

   i) Project name and WDID number;
   ii) QSP's name and phone number; and
   iii) Contractor's name and phone number.

   The sign shall be 48-inches by 96-inches and constructed of 1-inch laminated plywood. The sign lettering shall be a minimum of 4-inches in height, with black text on a white background. The lower edge of the sign shall be mounted a minimum of 6-feet (maximum of 7 feet) above grade.

   Details for the sign shall be included Section 1.3 of the SWPPP.

c) **Qualified SWPPP Developer (QSD)** The Contractor shall retain a QSD from the Issuance of Notice to Proceed Part 1 until the Work is completed, and a Notice of Termination has been filed by the Agency.

   The Contractor shall ensure that a QSD performs the following visual inspections of the Work site:

   1) Within 30 days of commencement of Work;
   2) Within 30 days of a Contractor replacing a QSD;
   3) Twice annually, once August through October and once January through March;
   4) Within 7 calendar days after a numeric action level exceedance; and
   5) As requested by the Engineer

d) **Qualified SWPPP Practitioner (QSP).** The Contractor shall designate retain a QSP from the Issuance of Notice to Proceed Part 1 until the Work is completed, and a Notice of Termination has been filed by the Agency. A copy of the QSP's certificate shall be included in Appendix I of the SWPPP.

The Contractor shall provide a QSP full-time on the Project site during all hours of the Work, and during Qualifying Precipitation Events. The QSP shall not delegate the responsibilities required by these specifications to a non-QSP.

The QSP shall have the responsibility and authority to fully implement the SWPPP.

e) **Accumulated Precipitation Procedure (APP).** The QSP shall implement the APP whenever a discharge of accumulated precipitation is necessary. The QSP shall notify the Engineer 24 hours prior to the scheduled discharge. Samples of accumulated precipitation shall be collected by the QSP and analyzed per Section 7.7 of the SWPPP or as directed by the Engineer prior to discharge.

f) **Visual Monitoring.** The QSP and/or QSD, as required, shall inspect the Work to ensure compliance with the SWPPP and these specifications; and shall document inspections on the BMP Checklist.

The QSP and/or QSD shall sign and submit one copy of the completed BMP Checklist to the Engineer within 24 hours of completing each inspection. One completed and signed copy of each BMP Checklist shall be kept with the SWPPP.

If any visual monitoring events required by the SWPPP are not conducted, the QSP shall notify the Engineer and the Environmental Compliance Unit (ECU) within 24 hours at oenrique@pw.lacounty.gov.

Contractor shall implement all BMP corrective actions within 24 hours.

1) **Rain Gauge Reading.** The QSP shall record the time, date, and rain gauge reading from the Agency's real-time rainfall data precipitation map, http://ladpw.org/wrd/precip/alert_rain/. If the rain event is a Qualifying Precipitation Event, the attach a copy to Appendix M.

2) **Water Quality Sampling and Analysis.** The QSP shall collect and analyze all water quality samples as required by the SWPPP. The QSP shall submit Monitoring Records (Appendix N) and Storm Event Monitoring Forms (Appendix O) the Engineer within 24 hours of the conclusion of each Qualifying Precipitation Event. Monitoring Record and Storm Event Monitoring Forms shall be completed for each Qualifying Precipitation Event regardless of whether samples were collected or not.

If any water quality samples are not collected during a sampling event required by the SWPPP, the QSP shall notify the Engineer and the Environmental Compliance Unit (ECU) within 24 hours at oenrique@pw.lacounty.gov

The QSP shall immediately evaluate the water sampling data. Data averaging is not permitted. If any single water sampling result exceeds the NALs and/or NELs, the QSP shall:

i. Notify the Engineer and the Environmental Compliance Unit (ECU) within 24 hours of any NAL Exceedance at oenrique@pw.lacounty.gov.
ii. Implement immediate corrective actions to address the cause of the exceedance and to prevent further exceedance.
iii. Prepare and submit a NAL exceedance report within 72 hours to the the Engineer.

3) **Annual Report.** The QSP shall prepare, sign, and submit to the Engineer an annual report for the reporting period of July 1 to June 30 of each year. The Annual Report Checklist and associated logs are included as Exhibit E at the end of this specification. The Annual Report shall include all BMP Checklists, Monitoring Records (Appendix N), and Storm Event Monitoring Forms (Appendix O), completed during the reporting period. If date of issuance of the Notice to Proceed occurs prior to June 30, the report shall be submitted no later than July 15 for the prior reporting period. If Work is completed and accepted prior to June 30, the report shall be submitted within 15 Days after being requested by the Engineer.

4) **Notice of Termination Report.** The QSP shall prepare, sign, and submit to the Engineer a Notice of Termination QSP Report within 15 days of the completion of Work.

The Notice of Termination QSP Report Checklist is included as Exhibit E.5 at the end of this specification and shall include a site map that includes the following:

i) Project boundaries and adjacent lands with labeled key features, such as roadways and waterbodies.
ii) Developed drainage basin boundaries and discharge location points.

iii) Site entrances and exits, lot boundaries, roads, structures, and features related to the project that may be used as a reference.

iv) Specific permanent erosion control BMPs, post-construction BMPs, and low impact development features.

v) Individual erosion control BMPs (including final landscaping) identified using hatch patterns, symbols, or shading unique to each BMP.

vi) Location and orientation of all photographs as required below.
The Notice of Termination QSP Report Checklist shall include the following photographs:

i) Photographs of each specific permanent erosion control BMPs, post-construction BMPs, and low impact development features.

ii) Photographs to document final site conditions and demonstrate compliance with post-construction requirements of the NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities No. CAS000002, Order No. 2022-0057-DWQ for Risk Level 2.

1.1.10 Enforcement. The Contractor shall implement corrective actions identified by the Engineer, to maintain compliance with the SWPPP and these specifications. Corrective actions identified by the QSP, or the Engineer shall be implemented within 24 hours of being identified. The Engineer may direct certain corrective actions to be implemented immediately.

Failure of the Contractor to implement corrective actions within the time specified above will result in written notification from the Engineer in the form of a “Notice of BMP Noncompliance Form”.

Part 1 of the “Notice of BMP Noncompliance Form” will include:

a) Description and location of the non-compliance.

b) Date and time that the non-compliance was identified.

c) Description of the corrective actions(s) identified by the Engineer.

d) Date and time the required corrective action(s) shall be completed.

For each corrective action identified in Part 1 of the “BMP Noncompliance Form”, not implemented by the date and time indicated, the Engineer will issue Part 2 of the “Notice of BMP Noncompliance Form”.

For each corrective action identified in Part 2 of the “BMP Noncompliance Form” not implemented by the date and time indicated, the Engineer will deduct from the Contractor’s monthly progress payment, or final payment, $1,000 per day per corrective action until the corrective action is implemented.

If a BMP non-compliance results in a non-stormwater discharge to the storm drain system, channel, streambed, or any other waterbody as determined by the Engineer, it will result in an immediate penalty of $1,000 per day until the corrective action is implemented. **This penalty may be assessed without prior written notification and may result in suspension of the Work.**

Repeat, or flagrant, non-compliance, as determined by the Engineer, will result in immediate penalty of $1,000 per day until corrective action is implemented. This penalty may occur without prior written notification and may result in suspension of the Work.

The Contractor shall be responsible for the costs and for the liabilities imposed by law as a result of its failure to fully-comply with these specifications. Costs and liabilities include, but are not limited to, fines, penalties and damages whether assessed against the Agency or the Contractor. In addition, the Engineer will deduct from any monies due to the Contractor, the total amount of any legal fees, staff costs, and consultant fees incurred as a result of the Contractor's non-compliance with these specifications.

1.1.11 Payment. Payment for preparation of the SWPPP and revisions to the SWPPP shall be considered as included in the Stipulated Unit Price for "PREPARATION OF THE SWPPP (STIPULATED UNIT PRICE OF $5,000)."

Payment for implementation of the SWPPP and amendments to the SWPPP shall be considered as included in the lump sum Bid Price for "IMPLEMENTATION OF THE SWPPP."

Payment shall include, but not limited to:

a) Providing a full-time QSP on the Project site during all hours of the Work and Qualifying Precipitation Events per 1.1.9.d, providing a QSD to perform inspections per 1.1.9.c, and all QSD/QSP training per 1.1.1.

b) Performing all visual monitoring per 1.1.9.f.

c) Providing, installing, and removing project signage per 1.1.9.b.

d) Furnishing, installing, maintaining, removing, and disposing of all BMPs per 1.1.5, including all corrective actions per 1.1.

e) APP implementation per 1.1.9.e.

f) Conducting and reporting all water quality sampling and analysis data per 1.1.9.f.2 including NAL/NEL Exceedance Reports,

g) Preparing and submitting Annual Reports, including revisions per 1.1.9.f.3.

h) Preparing and submitting Notice of Termination QSP Report per 1.1.9.f.4.

i) Subscription to CASQA BMP Manuals

If the BMPs selected in the certified SWPPP do not meet the performance standards of these special provisions, the Contractor shall implement additional BMPs and amend the SWPPP at no additional cost to the Agency.

Payment will be prorated on a monthly basis over the duration of the Contract. The final payment will not be made until the Engineer has filed a Notice of Termination (NOT).

ATTACHMENT:

Exhibit E – Documentation Required to Supplement the CASQA SWPPP

- Exhibit E.1 – Best Management Practices (BMP) Checklist
- Exhibit E.2 – LACPW 2022 CGP Cover Sheet and Certification Page
- Exhibit E.3 – Accumulated Precipitation Procedure (APP) Template
- Exhibit E.4 – Annual Report Checklist
- Exhibit E.5 – Notice of Termination Reporting Checklist

Revised: 03/2024

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Exhibit E

Documentation Required to Supplement the CASQA SWPPP

Exhibit E.1 - Best Management Practices (BMP) Checklist

Exhibit E.2 - LACPW 2022 CGP Cover Sheet and Certification Page

Exhibit E.3 - Accumulated Precipitation Procedure (APP) Template

Exhibit E.4 - Annual Report Checklist

Exhibit E.5 - Notice of Termination Reporting Checklist

Note: Electronic files of these documents are available on request.

EXHIBIT E.1

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
BEST MANAGEMENT PRACTICES (BMP) CHECKLIST

Project Name: _____ PCA No.: _____ Report No: _____

Contractors Name: _____ Project ID No.: _____ Inspection Time: _____

QSP Name: _____ PM/CM Name: _____ Inspection Date: _____

Signature: _____ Signature: _____ Report Date: _____

Inspection Type: ☐ Weekly ☐ Pre-Storm ☐ Post-Storm ☐ During ☐ Other_____

Stage of construction: ☐ Utilities ☐ Grading/excavation/drilling ☐ Paving/general construction ☐ Vertical ☐ Final landscaping/stabilization

Approximate area of construction exposed (acres): _____ Are SWPPP amendments necessary? ☐ Yes ☐ No

Construction activities completed (add additional pages if needed): _____

Are all paved roads that provide access to the project inspected daily for tracking of sediment and other debris? ☐ Yes ☐ No

Are there any odors, sheens, turbidity, floating or suspended materials, discoloration on any water discharges? ☐ Yes ☐ No ☐ N/A

If yes, describe the source:_____

Weather Information:

Was precipitation present during inspection? ☐ Yes ☐ No Precipitation Amount (in.) _____

Beginning date/time of the QPE: _____ Rain Guage Station: _____

Duration of the QPE (days:Hrs): _____ End Date/Time of QPE: _____

Erosion Conrol BMPs

Included in SWPPP?		BMP Description		Deployed on Site?		Adequately designed /implemented?			Maintained/ effective?			Location/Deficiencies/Corrective Actions/Implementation Dates
Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	EC-1	Scheduling	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-2	Preserve Existing Vegetation	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-3	Hydraulic Mulch	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-4	Hydroseeding	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-5	Soil Binders	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-6	Straw Mulch	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-7	Geotextiles & Mats	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-8	Wood Mulching	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-9	Earth dikes/drainage swales and	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-10	Outlet Protection/Velocity Dissipation	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-11	Slope Drains	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-12	Streambank Stabilization	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-14	Compost Blankets	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-15	Soil Preparation / Roughening	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	EC-16	Non-Vegetative Stabilization	☐	☐	☐	☐	☐	☐	☐	☐	

Temporary Sediment Control BMPs

Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	SE-1	Silt Fence	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-2	Desilting Basin	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-3	Sediment Trap	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-4	Check Dam	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-5	Fiber Rolls	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-6	Gravel Bag Berm	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-7	Street Sweeping and Vacuuming	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-8	Sandbag Barrier	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-10	Storm Drain Inlet Protection	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-12	Manufact. Linear Sediment Controls	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-13	Compost Socks and Berms	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	SE-14	Biofilter Bags	☐	☐	☐	☐	☐	☐	☐	☐	

Wind Erosion Control BMPs

Included in SWPPP?		BMP Description		Deployed on Site?		Adequately designed /implemented?			Maintained/ effective?			Location/Deficiencies/Corrective Actions/Implementation Dates
Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	WE-1	Wind Erosion Control	☑	☐	☐	☐	☐	☐	☐	☐	

Tracking Control BMPs

Included in SWPPP?		BMP Description		Deployed on Site?		Adequately designed /implemented?			Maintained/ effective?			Location/Deficiencies/Corrective Actions/Implementation Dates
Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	TC-1	Stabilized Construction Entrance/Exit	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	TC-2	Stabilized Construction Roadway	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	TC-3	Entrance/Outlet Tire Wash	☐	☐	☐	☐	☐	☐	☐	☐	

Temporary Non-Storm Water BMPs

Included in SWPPP?		BMP Description		Deployed on Site?		Adequately designed /implemented?			Maintained/ effective?			Location/Deficiencies/Corrective Actions/Implementation Dates
Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	NS-1	Water Conservation Practices	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-2	Dewatering Operations	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-3	Paving and Grading Operations	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-4	Temporary Stream Crossing	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-5	Clear Water Diversion	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-6	Illicit Connection/ Illegal Discharge	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-7	Potable Water/ Irrigation	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-8	Vehicle and Equipment Cleaning	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-9	Vehicle and Equipment Fueling	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-10	Vehicle and Equipment Maintenance	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-11	Pile Driving Operations	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-12	Concrete Curing	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-13	Concrete Finishing	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-14	Material Over Water	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-15	Demolition Adjacent to Water	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	NS-16	Temporary Batch Plants	☐	☐	☐	☐	☐	☐	☐	☐	

Temporary Materials Management BMPs

Included in SWPPP?		BMP Description		Deployed on Site?		Adequately designed /implemented?			Maintained/ effective?			Location/Deficiencies/Corrective Actions/Implementation Dates
Yes	No			Yes	No	Yes	No	N/A	Yes	No	N/A	
☐	☐	WM-1	Material Delivery and Storage	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-2	Material Use	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-3	Stockpile Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-4	Spill Prevention and Control	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-5	Solid Waste Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-6	Hazardous Waste Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-7	Contaminated Soil Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-8	Concrete Waste Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-9	Sanitary/Septic Waste Management	☐	☐	☐	☐	☐	☐	☐	☐	
☐	☐	WM-10	Liquid Waste Management	☐	☐	☐	☐	☐	☐	☐	☐	

Attach photos as needed

EXHIBIT E.2

LOS ANGELES COUNTY PUBLIC WORKS STORMWATER QUALITY DIVISION LEGALLY RESPONSIBLE PERSON (LRP) OR AUTHORIZED SIGNATORY CERTIFICATION PAGE

Insert Project Name

Insert Project ID

This signed Certification Page certifies that this SWPPP and all other Permit Required Documents (PRDs) have been approved and accepted to be in accordance with the requirements of the contract Special Provisions and the Construction General Permit.

The Legally Responsible Persons (LRPs) for the Los Angeles County of Public Works, Project Management Division III, has designated Oscar R. Enriquez as their Authorized Signatory.

Signature	Date
Oscar R. Enriquez Supervisor, Environmental Compliance Unit	(626) 300-4779 Telephone Number

EXHIBIT E.3

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ACCUMULATED PRECIPITATION PROCEDURE
(APP)

Project Name	
Project ID	
Contractor Name	

REQUIRED TEXT:

Accumulated Precipitation Procedure (APP)

This project may accumulate precipitation due to: [Insert brief description of how precipitation may be trapped on site such as in low lying areas, planned excavations or other means where it may be necessary to discharge water to the storm drain system or water body.]. No accumulated water will be discharged without implementing this Accumulated Precipitation Procedure (APP).

Areas Expected to Accumulated Precipitation

[Describe in detail the areas that are expected to accumulate rain water on the construction site. These locations are shown on WPCD [insert WPCD page number]

BMPs Selected for Accumulated Precipitation

[Describe BMPs that are selected for the project that will ensure the discharge of accumalated precipitation meet to NALs/NELs identiifed in the SWPPP.]

Alternative Disposal Option(s) for not Discharging Accumulated Precipitation

[Describe options for not discharging accumulated precipitation offsite such as storing the water on site, infiltration, using the water for dust control or other methods.]

Inspection Prior to Discharge

After a precipitation event, water that has accumulated in the excavation that may need to be discharged. The water shall be inspected to determine whether it has come into contact with any other pollutants (e.g., spilled fuel, contaminated soil, etc.) prior to discharge. If other pollutants are suspected, the water will be handled in accordance with BMP WM-10 liquid waste management for disposal off site.

Discharge BMPs and Location(s)

If sediment is the only potential pollutant, the accumulate precipitation will be [Describe how NS-2 Dewatering Operations BMPs will be implemented including a description of the selected BMPs and equipment utilizied to meet the NALs/NELs in the SWPPP.]

[Describe location(s) of the discharge such as to the gutter, drain inlet, water body, etc. Include BMPs for erosion control and velocity dissipation at the discharge point points where erosion could occur.]

Notifications

The Contractor shall notify the Engineer as follows:

- A minimum of 24 hours prior to each discharge of accumulated precipitation.
- Malfunction of BMPs or equipment used for the discharge of accumulated precipitation.
- Exceedance of any NAL/NELs.
- Revisions to the APP.

Inspection, Maintenance, and Repair

The accumulated precipitation discharge and associated BMPs and equipment will be continuously monitored during discharge events and documented on the BMP Checklist.

The flow path or conveyance will be inspected and cleaned of all sediment, debris, and trash. In the event that the BMPs or equipment are not functioning adequately, the discharge will be terminated until revised or repaired to function adequately. This may require a revision to this APP and approved by the Engineer.

Sampling and Analysis

Prior to the discharge of accumulated precipitation, the QSP shall sample and analyze all discharge in accordance with Section 7.7 of the SWPPP. The QSP shall continue to sample and analyze discharge every 24 hours until the discharge is complete.

The results shall be submitted to the Engineer and maintained in the SWPPP. If the analysis indicates an exceedance of any NALs/NELs then the discharge shall not commence or be immediately terminated.

QSP/QSD Signature	Date
QSP/QSD Name (printed)	QSP/QSD Certificate No.

EXHIBIT E.4

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT CHECKLIST

Project Name	
Project WDID	
Contractor Name	
Reporting Period: From Date (dd/mm/yy) to Date (dd/mm/yy)	

Complete the following Checklist:

Reporting Period	**Yes**	**No**
Was Contractor Active for 3 Months or more during this Reporting Period?		

General Information	
QSD Name and Certificate Number.	
QSP Name and Certificate Number.	
Provide names and Certificate Numbers of additional QSPs or QSDs that performed inspections or sampling.	

Visual Inspections	**Yes**	**No**
Were all visual inspections performed per the SWPPP and General Permit? Attach the “Inspection Log” and all BMP Checklists.		
Were there any visual inspection exceptions? If Yes, attach the “Inspection Exception Log”.		
Note: For "Inspections Exceptions", please refer to Attachment D (III.B.1) of the CGP for conditions that exempt performing inspections. If these conditions are not met, then inspections are required.		

Sampling Events	**Yes**	**No**	**Response**
How many Qualifying Precipitation Events occurred during this reporting period? Attach completed Rain Gauge Readings (Appendix M) of the SWPPP.			
How many of these Qualifying Precipitation Events were sampled? Attach completed Storm Event Monitoring Forms (Appendix O) of the SWPPP.			
Did visual inspections trigger any Non-Visual Pollutants/TMDL Sampling Events per Section 7.71 of the SWPPP? If Yes, how many?			
How many of these Non-Visual Pollutants/TMDL Sampling Events were sampled? Attach completed Attach completed Effluent Sampling Field Log Sheets and COC Forms (Appendix O) of the SWPPP.			
Were any dewatering activities conducted? If Yes, how many?			
If yes, were these dewatering activities conducted under the requirements of the 2022 CGP or a separate NPDES Permit			
If Yes, how many of these Dewatering Events were sampled? Attach completed Effluent Sampling Field Log Sheets and COC Forms (Appendix O) of the SWPPP.			
Where all Monitoring Records and Storm Event Monitoring Forms submitted to the Engineer within 24 hours of the conclusion of each Sampling Event.			

Sampling Events (continued)	Yes	No	Response
Were there any sampling events missed? If Yes, attach the “Sampling Exception Log”.			
Were there any sampling violations? If Yes, attach the “Violations Log”.			
Was the Engineer notified of any sampling violations with 24 hours? If Yes, attach documentation of notification.			
Note: For "Sampling Exceptions", refer to Attachment D (III.B.1) of the CGP for conditions that exempt sampling. If these conditions are not met, then sampling is required.			

Violations	Yes	No
Were there any of the following General Permit violations? If Yes, identify below and attach the “Violations Log”.		
Deficient BMP Implementation?		
Deficient Reports?		
Effluent Violations?		
Incomplete/Insufficient SWPPP?		
Unauthorized NSWD?		
Other?		
Was the Engineer notified of any General Permit violations with 24 hours? If Yes, attach documentation of notification.		

Corrective Actions	Yes	No
Were any Corrective Actions required? If Yes, attach the “Corrective Action Log”.		
Were there any Unimplemented Corrective Actions? If Yes, attach the “Unimplemented Corrective Action Log”.		

Penalty of Perjury Statement. "I declare under the penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. The information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

QSP/QSD Signature	Date
QSP/QSD Name (printed)	QSP/QSD Certificate Number

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – INSPECTION LOG

Inspection Type[1]	Name of QSP/QSD	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Additional Comments

(1) Inspection Type: Weekly, Pre-Storm, During Strom, or Post-Storm

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – INSPECTION EXCEPTIONS LOG

Inspection Type[1]	Name of QSP/QSD	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Explanation of Missed Inspection

(1) Inspection Type: Weekly, Pre-Storm, During Strom, or Post-Storm

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – SAMPLING EXCEPTIONS LOG

Sampling Type[1]	Name of QSP/QSD	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Explanation of Missed Sampling

(1) Sampling Type: Stormwater Discharge Sampling, Receiving Water Sampling, Non-Visible Sampling, or Dewatering

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – VIOLATIONS LOG

Violation Type(1)	Description	Reported By(2)	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Additional Comments

(1) Violation Type: Deficient BMP Implementation, Deficient Report, Effluent Violation, Incomplete/Insufficient SWPPP, Unauthorized NSWD, or other.
(2) Reported By: Contractor's QSP/QSD, Public Works, Local Agency, or 3rd Party.

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – CORRECTIVE ACTIONS LOG

Corrective Action /Compliance Activity	Description	Performed By	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Additional Comments

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
ANNUAL REPORT – UNIMPLEMENTED CORRECTIVE ACTIONS LOG

Corrective Action/Compliance Activity Not Performed	Explanation	Date (MM/DD/YYYY)	Time (HH24:MIN)	Location	Additional Comments

EXHIBIT E.5

LOS ANGELES COUNTY PUBLIC WORKS
STORMWATER QUALITY DIVISION
NOTICE OF TERMINATION
QSP REPORT CHECKLIST

Project Name	
Project WDID	
Contractor Name	

The QSP shall prepare, sign, and submit to the Engineer a Notice of Termination Report within 15 days of the completion of Work. Check each box below to verify the requirement is included in the NOT report.

The Notice of Termination Report shall include a site map containing the following:

- ☐ Project boundaries and adjacent lands with labeled key features, such as roadways and waterbodies.
- ☐ Developed drainage basin boundaries and discharge location points.
- ☐ Site entrances and exits, lot boundaries, roads, structures, and features related to the project that may be used as a reference.
- ☐ Specific permanent erosion control BMPs, post-construction BMPs, and low impact development features.
- ☐ Individual erosion control BMPs (including final landscaping) identified using hatch patterns, symbols, or shading unique to each BMP.
- ☐ Location and orientation of all photos used to document final site conditions and demonstrate compliance with post-construction as required below.

The Notice of Termination Report shall include the following photographs:

- ☐ Photographs of each specific permanent erosion control BMPs, post-construction BMPs, and low impact development features.
- ☐ Photographs to document final site conditions and demonstrate compliance with post-construction requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities No. CAS000002, Order No. 2022-0057-DWQ.

QSP Signature	Date
QSP Name (printed)	QSP Certificate Number

SECTION 01 57 19

TEMPORARY AND ENVIRONMENTAL CONTROLS

SECTION 1 - GENERAL

1.1 SUMMARY

A. This section establishes general control requirements for protection of land and water resources; control of noise, dust, and debris, and other environmental pollution; regulation traffic, and control of other activities of the Contractor and the Contractor's subcontractors in performance of the work of the contract.

B. The Contractor will be responsible for providing and obtaining approval of a Storm Water Prevention Pollution Plan per Section 01 57 00.

1.2 DEFINITIONS

A. Environmental pollution and damage means the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to human life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

B. Sediment means soil and other debris that has been eroded and transported by storm or well production runoff water.

C. Inert solids/inert waste means non-liquid solid waste including, but not limited to, soil and concrete, that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established pursuant to Division 7 of the California Water Code and does not contain significant quantities of decomposable solid waste.

D. Inert fill means a permitted facility that accepts inert waste such as asphalt and concrete exclusively.

E. Construction and demolition waste includes solid wastes such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair, and demolition operations.

1. Rubbish includes both combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal and lumber scrap, tin cans, and bones.

2. Debris includes both combustible and noncombustible wastes such as leaves and tree trimmings that result from construction or maintenance and repair work.

F. Class III landfill means a landfill that accepts nonhazardous waste such as household, commercial, and industrial waste, including construction, remodeling, repair, and demolition operations.

G. Chemical waste includes petroleum products, bituminous materials, salts, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.

H. Sanitary Wastes:

1. Garbage includes refuse and scraps resulting from preparation, cooking, distribution, or consumption of food;

2. Sewage means domestic sanitary sewage.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00.

B. Environmental Protection Program: Prior to commencement of the work of this contract. Compile and submit to the County the written environmental protection program proposed by the Contractor for compliance with requirements of this section, as defined under paragraph 1.4 below. Meet with the County to review the proposed environmental protection program, make changes in the plan, and secure the County's approval of the written environmental protection program, prior to commencement of the work.

C. Storm Water Pollution Prevention Plan: Prior to beginning any demolition or excavation on Projects greater than one acre, the Contractor will prepare a Storm Water Pollution Prevention Plan (SWPPP) and submit to County as required in Section 01 57 00. The Contractor will also obtain and become familiar with the latest edition of the Los Angeles County Department of Public Works Construction Site Best Management Practices (BMP's) Manual. The BMP Manual presents specific guidance on selecting practices that reduce pollutants in storm water discharges from construction activities.

1.4 QUALITY CONTROL

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this section. Comply with all pertinent Federal, State, and local regulations pertaining to water, air, solid waste, and noise pollution. Require the Contractor's subcontractors to comply with the provisions of this section.

B. Environmental Protection Program:

1. After award of the contract, and prior to commencement of the work, schedule and conduct a meeting with the County representatives to discuss solid waste management and environmental protection, recycling, and rebate programs required in connection with the work.

2. Not more than 21 calendar days after the meeting, prepare and submit a written and/or graphic Solid Waste Management and Environmental Protection Plan including, but not necessarily limited to:

a. List of Federal, state and local laws, regulations, and permits concerning environmental protection, pollution control, noise abatement, and noise control that are applicable to the Contractor's proposed operations;

b. Procedures to be implemented to provide the required environmental protection and to comply with applicable laws and regulations;

c. Location or locations of solid waste disposal areas proposed to be used by the Contractor, with statement as to current permits or licenses issued to those disposal areas;

d. Contractor's proposed procedures for recycling and re-use of materials;

e. Contractor's proposed participation in rebate programs.

f. Revise and submit the Solid Waste Management and Environmental Protection Plan as required by the County.

g. Approval of the Contractor's Waste Management and

Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protective measures.

3. With each application for progress payment, submit a summary of solid waste generated by the construction and demolition operations.

   a. Submit on form copied from the example at the end of this section on a different form acceptable to the County;

   b. Include copies of all manifests, weight tickets, receipts, and invoices specifically identifying the work and waste materials from recycling centers, class III landfills, and inert fills.

C. Prepare and maintain a 3-ring binder with rebate information and product identification as required for the County to qualify for rebate programs; submit the binder with final closeout submittals.

D. Storm Water Pollution Prevention Plan:

   a. The Contractor will begin preparing the SWPPP per Section 01 57 00 immediately after the receipt of Notice to Proceed No.1. The Contractor and the County will meet not more than (21) calendar days after NTP No.1 to review the SWPPP.

   b. The Contractor will comply with Best Management Practices (BMP) outlined in the Los Angeles County Department of Public Works Construction Site Best Management Practices (BMP's) Manual.

   c. The Contractor will be responsible for training and implementing the SWPPP and BMPs during construction per Section 01 57 00. The Contractor will schedule and conduct inspections with oversight agencies upon their request.

   d. The Contractor will be responsible for amending the SWPPP as required by Section 01 57 00 of these special provisions.

SECTION 2 - PRODUCTS

2.1 MATERIALS

Except for materials proposed by the Contractor for compliance with the requirements of this Section, and approved in advance by the County, no materials are needed.

SECTION 3 - EXECUTION

3.1 PROTECTION OF LAND RESOURCES

A. It is intended that land resources within boundaries of the project, but outside the limits of permanent work performed under this contract, shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project.

B. Insofar as possible, confine activities of the Contractor to pertinent areas defined on the drawings or elsewhere in the Contract Documents. Maintain natural drainage patterns. Conduct construction activities in such a manner that ponding or stagnant water conducive to mosquito breeding habitat will not occur at any time.

C. Land Resources: Do not remove, cut, deface, injure, or destroy trees or other vegetation outside the work area limits. Do not remove, cut, deface, injure, or destroy trees or other vegetation inside the work area limits except as permitted by the County and where land resources are damaged by the Contractor, promptly replace or repair to the approval of the County and at the Contractor's expense.

D. Tree Trimming: In accordance with recognized standards for such work, trim and seal tree limbs overhanging the line of the work and in danger of being damaged by the Contractor's operations. Remove other tree limbs as directed by the County so the tree will present a balanced appearance. Roots: Do not cut any roots unnecessarily during excavating or trenching operations, expose roots 75 mm (3 inches) in diameter of larger, encountered in the course of excavation, and do not sever but wrap them in burlap as a protective measure while exposed, and at the edge of the excavation or trench, neatly trim all roots 25 mm (1 inch) in diameter or larger that are severed in the course of excavation and paint them with a heavy coat of tree seal approved by the County.

E. When and as directed by the County obliterate all signs of temporary construction such as work areas, structures, foundation of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction; Level all temporary roads, parking areas, and other areas which have become compacted or shaped; At unpaved areas where vehicles are operated, provide a suitable surface treatment or wet down periodically to prevent dust from becoming a nuisance, keep haul roads clear of objects which create unsafe conditions, and promptly remove contaminants and construction materials dropped from construction vehicles.

F. Do not drop mud and debris from construction vehicles onto public streets; sweep turning areas and pavement entrances as needed.

3.2 NOISE CONTROL: Do not permit noise levels exceeding the following:

A. Trenchers, pavers, graders, and trucks: 90 dBA at 50 feet as measured under the noisiest operating conditions;

B. All other equipment: 85 dBA at 50 feet.

C. Use whisperized type generators as approved by the County.

D. Jack Hammers: Equip with exhaust mufflers and steel muffling sleeves; Use whisperized type air compressors as approved by the County.

E. Operations: Keep noise equipment as far as possible from noise-sensitive site boundaries, do not leave machines idling, use electric power in lieu of internal combustion engine power when practicable; Maintain equipment in a manner to reduce noise from excessive vibration, faulty mufflers, and similar sources, provide mufflers on all engines, and schedule operations to minimize their duration at any given location.

F. Monitoring: As needed, provide portable sound metering devices meeting requirements of ANSI S1.4 for Type 2 sound level meters. Promptly locate and correct noncomplying noise levels.

G. Contractor shall take all practical measures to minimize, or eliminate if possible, air borne and structure borne noise generated from construction activities. Contractor shall comply with the ground vibration limits as specified by ANSI S3.29-1983.

H. The use of explosives and riveting will be prohibited.

3.3 RECYCLING REQUIREMENTS

Implement a recycling program which includes separate collection of waste materials. Refer to technical specifications for recycling of building materials via an on-site crushing operation.

3.4 ARCHAEOLOGICAL FINDINGS DURING CONSTRUCTION

There are no known archaeological remains at the project site. Should skeletons artifacts, or other archaeological remains be uncovered: Suspend operations of this contract at the site of discovery, continue operations in other areas, and notify the County immediately of the finding. Should the discovery site require archaeological studies resulting in delays and/or additional work, the Contractor will be compensated by an adjustment under pertinent provisions of the contract.

3.5 BURNING RUBBISH AND DEBRIS

Do not permit open burning of rubbish, debris, and/or other combustibles on the site.

3.6 DUST CONTROL/AIR QUALITY

A. Contractor shall prevent air borne debris and dust generated during construction activities from traveling outside the area of work in accordance with SCAQMD Rule 403. All loose materials being hauled onto or out of the site in open truck beds or trailers shall be covered in accordance with State of California Vehicle code Section 23114. Wheels of all vehicles shall be cleaned prior to leaving the Project site.

B. County and City of Los Angeles streets shall be kept free of construction dirt and debris at all times by use of street sweeping equipment. The degree of cleanliness to be maintained will be determined by the County.

C. Contractor shall water down all construction activities, such as excavation that create dust.

D. The Contractor shall provide temporary dust proof enclosures to ensure that particulate matter does not migrate outside of enclosed work areas to adjacent occupied hospital areas. The Contractor’s means and methods shall dictate the exact method used to comply with this requirement.

E. Maintain and operate construction equipment so as to minimize exhaust emissions. During construction, the site shall be watered and all equipment cleaned once a day to reduce particulate and dust emissions.

F. The Contractor shall not allow any construction equipment with an internal combustion engine to idle more than five (5) minutes in accordance with California Vehicle Code § 2485 (diesel).

3.7 COMPLIANCE

A. The County will notify the Contractor in writing of any observed noncompliance with the provisions of this section, and will describe actions to be taken. Such notice, when delivered to the Contractor or his authorized representative at the job site, will be deemed sufficient for the purpose. Immediately upon receipt of such notice, initiate the required action or actions.

B. Noncompliance: If the Contractor fails or refuses to comply promptly, the County may issue an order stopping all or part of the work of this contract until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was determined that the Contractor was in compliance.

3.8 TRAFFIC REGULATION

A. Traffic Maintenance: Determine the routing of construction vehicles before starting work, based on restrictions indicated on the drawings and the safeguards and procedures necessary to carry out the work. In addition be responsible for controlling construction traffic within and adjacent to the site, provide all entrances, lifts and safeguards required necessary to the progress of the work, and effectively control such traffic to provide minimum hazard to the work and all persons, route all construction equipment, trucks, and similar vehicles via existing public streets to and from the site as approved by the governing authorities and the Construction Access Plan.

B. Obtain and pay for permits and inspections necessitated by the use of public streets, sidewalks, curbs, and paving. Post guarantees and bonds that may be required, and repair and make good any damages thereto, acceptable to the authorities having jurisdiction, construct and maintain temporary walks and bridges for pedestrians. Keep streets adjacent to the site open to vehicular and traffic.

C. Maintain constant access for police, fire, and ambulance service.

D. Provide and maintain for proper control of traffic and safety of all concerned. All necessary barricades, suitable and sufficient lights, reflectors, and danger signals, warning and closure signs, directional and detour signs, and whatever additional measures necessary.

E. Indicate on a 24-hour basis all restricted and dangerous conditions existing on or adjacent to the site, illuminate barricades, danger signals, warning signs and obstructions and night and keep waning lights burning from one hour before sunset and until one hour after sunrise.

3.9 Parking: Do not permit parking on site to interfere with activities related to the performance of the work. The Contractor is responsible for providing offsite parking for all Contractor construction personnel at no additional cost to the County, if the County provided Contractor parking area does not provide enough parking spaces for construction personnel.

END OF SECTION

SECTION 01 60 00

PRODUCT HANDLING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included: Products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's written quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURER'S RECOMMENDATIONS

A. Except as otherwise approved by the Architect, determine and comply with manufacturer's recommendations on product handling, storage, and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

B. Maintain packaged materials with seals unbroken and labels intact until time of use.

C. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the County.

D. The Architect may reject as non-complying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

A. Protect unfinished surfaces, including jambs and soffits or openings used as passageways, through which equipment and material are handled.

B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the County.

1.6 REPAIRS AND REPLACEMENTS

A. In the event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the County.

B. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01 66 00

TRANSPORT, HANDLING & STORAGE

PART 1 GENERAL

1.01 DESCRIPTION (PREPARATION FOR SHIPMENT)

A. Shop prime:

1. Structural steel surfaces not to be encased in concrete shall be shop primed with specified primer. Refer to Section 05 12 00 Structural Steel for primer.

2. After factory tests and acceptance, machined and/or polished surface to remain unpainted shall be coated with minimum 2 mil thickness of rust preventive compounds, or as recommended by manufacturer.

B. Protection:

1. Protect steel surfaces to ensure that their cleanliness during shipment, storage and erection.

2. Protect structural steel against damage from all sources whether mechanical, chemical or environmental.

1.02 TRANSPORTATION AND HANDLING

A. Verification of intent to ship, arrival date and cartage company must be made known to County by Contractor.

B. Immediately on delivery, a complete and thorough inspection of the structural steel by County and Contractor shall be made. Any damages incurred in shipping or handling shall be replaced promptly by Contractor at no cost to the County.

1.03 STORAGE AND PROTECTION

A. Storage and protection shall be the responsibility of the Contractor.

B. Provide complete weather protection for stored structural steel. Storage must be in Los Angeles County, and all material must be insured.

C. Inspection of stored structural steel to assure it will be free from damage or deterioration shall be provided at no additional cost.

D. All storage, handling and rehandling costs, insurance and responsibility for protection and proper installation of such material is the obligation of the Contractor. No payment, pursuant to this provision for material shall in any way relieve the Contractor of its responsibility to obtain or provide, at its expense, any such material or release the Contractor from any of its obligations under this Contract.

E. Department may enter upon the premises where the material is stored for inspection, checking, or any other purpose he deems necessary.

F. The Contractor will be reimbursed for any Los Angeles County taxes levied against such material while so stored, upon presentation of the receipted tax bill for same.

G. Contractor must furnish with his Request for Payment acceptable evidence showing such material has been paid for in full, together with a verified statement that same is/are free from liens and encumbrances and will be utilized in the work covered by this Contract and a material list sufficient for physical inventory at the storage location.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING FOR LOS ANGELES COUNTY PROJECTS

PART 1 GOAL

Consistent with the County's efforts to comply with the California Integrated Waste Management Act of 1989 (Public Resources code, Section 40000 et seq.), one goal of this project is to reduce, reuse, and/or recycle the construction and demolition debris generated by the project in accordance with Los Angeles County Code, Chapter 20.87, Construction and Demolition Debris Recycling and Reuse.

PART 2 GENERAL DEBRIS RECYCLING REQUIREMENTS

2.1 Prior to the commencement of construction, the Contractor shall submit to the Los Angeles County Public Works, Environmental Programs Division (EPD), a Construction and Demolition Recycling and Reuse Plan (RRP) via EPIC-LA.

2.2 Contractor shall submit a RRP for any work done for or on behalf of the County that generates C&D debris.

PART 3 DEBRIS RECYCLING REQUIREMENTS FOR ANY WORK DONE FOR OR ON BEHALF OF THE COUNTY

3.1 The RRP submitted in accordance with Paragraph 2.2 of this Section must demonstrate that the Contractor will reduce, reuse, and/or recycle the C&D debris generated by the project. The RRP must demonstrate that the project will deliver debris to an approved facility for recycling or reuse of at least 70% of the mixed and inert debris and 100% of soil and land clearing debris generated by the project. A list of approved facilities is available on the CND website under reference materials (dpw.lacounty.gov/epd/CD/cd_attachments/Recycling_Facilities.pdf).

The RRP must also identify proper recycling or disposal of 100% of universal waste generated by alteration or renovation projects.

3.2 As part of the Contractor's request for final payment, the Contractor shall submit a Final Compliance Report to EPD for review and approval.

The Final Compliance Report shall include information and documentation as set forth in the Section D of the C&D Recycling and Reuse Guidelines.

3.3 As part of the approval of the final payment, EPD will review the Final Compliance Report to determine if the Contractor documented the quantity of debris generated, reused, and recycled, and achieved a recycling/reuse rate at least 70% by weight and of mixed and inert debris and 100% of soil debris generated and disposed during the project duration.

3.4 If EPD determines that the applicant has not provided sufficient documentation to show that all of the project C&D Debris and universal waste included in the RRP, were properly recycled, reused and/or disposed, within one year of the completion of the project plus any additional time provided by Public Works for the correction of any deficiencies, or if the documentation indicates that the project C&D debris and universal waste were not properly recycled, reused and/or disposed, EPD will calculate the applicable penalty in accordance with the penalty schedule below:

Tons of C&D Not Recycled and Not Reported	Penalty Amount	
For up to the first ton	$ 100	fixed amount; plus, as applicable, amounts below
From above the first ton up to 15 tons	$ 60	per ton (or fraction thereof); plus, as applicable, amounts below
From above 15 tons up to 45 tons	$ 45	per ton (or fraction thereof); plus, as applicable, amounts below
From above 45 tons	$ 30	per ton (or fraction thereof)

PART 4 COST

Cost of compliance with the C&D Ordinance shall be considered as included in the Contractor's lump sum base bid.

SECTION 01 74 23

FINAL CLEANING

1.00 GENERAL

1.01 DESCRIPTION

A. Principal work in this Section:

1. Keep premises, adjacent private properties and public properties free from accumulations of waste, debris and rubbish caused by construction operations.

2. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces.

1.02 SAFETY REQUIREMENTS

A. Standards: Maintain Project in accord with State and local safety and insurance standards.

B. Hazard control:

1. Store volatile wastes in covered metal containers, and remove from premises daily.

2. Prevent accumulation of wastes which create hazardous conditions.

3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on Project site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains. Store in containers with tight-fitting lids and remove to legal dump site.

3. Special reference is made to the Los Angeles County Department of Public Works Storm Water Pollution Control Requirements for Construction Sites which require implementation of the NPDES standards. <u>The cost of implementing the NPDES standards and adhering to the Storm Water Pollution Control Requirements must be included in the lump sum bid for the Project.</u>

2.00 PRODUCTS (Not applicable)

3.00 EXECUTION

3.01 DURING CONSTRUCTION

A. Remove or paint over, as appropriate to the substrate, graffiti on the site or surrounding fence daily.

B. Wet down materials and rubbish to lay dust and prevent it from blowing.

C. Provide on-site covered containers for collection of waste materials, debris and rubbish. Provide a collection can at each location used as an eating area. Pick-up all garbage daily.

D. Remove waste materials, debris and rubbish from site and legally dispose of at legal public or private dumping areas off County's property.

E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

F. Comply with the County of Los Angeles Department of Health design /construction and maintenance risk assessment: Policies and Procedures Infection Control Policy Guidelines Procedure No.918.01.

3.02 FINAL CLEANING

A. In preparation for Substantial Completion or Occupancy conduct final inspection of all work.

B. Repair, patch and touch-up marred surfaces to specified finish to match adjacent surfaces.

C. Contaminated earth:

1. Final clean-up operation includes the removal and disposal of earth contaminated or unsuitable for support of plant life in planting areas, and filling of resulting excavations with suitable soil.

2. Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, and similar materials, areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and areas that have been oiled, paved, or chemically treated.

3. Do not dispose of waste oil, solvents, paints, solutions, or like penetrating material by depositing or burying on County's property. All

material shall be disposed in accordance with all regulatory requirements.

D. Broom clean paved surfaces; rake clean other surfaces of grounds.

E. Keep Project clean until Final Acceptance by the County.

END OF SECTION

SECTION 01 75 00

PROJECT ADDED STOCK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work in This Section: Principle items include:

1. Providing Added Stock Materials to the Owner.

B. Related Work Not in This Section:

1. Project Closeout.

2. Documents affecting Work of this Section include, but are not necessarily limited to, sections in all divisions of these Specifications.

1.02 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Added Stock to one person on the Contractor's staff as approved by the County.

B. All materials shall be delivered to the County in original, unopened containers bearing the manufacturer's original labels.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 23.

B. Prior to submitting request for final payment, transmit the final Project Added Stock to the County and secure County approval.

1.04 ADDED STOCK PROTECTION AND HANDLING

A. Maintain the Added Stock completely protected from deterioration, loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.

PART 2 – PRODUCTS

2.01 ADDED STOCK

A. All materials delivered, as Added Stock, shall exactly match the materials used on the project. Materials shall be from the same dye-lots, production runs, and color matching and match the installed materials.

PART 3 - EXECUTION

3.01 SCHEDULE OF MATERIALS

Section	Item	Quantity
04 2113	Brick veneer	At least 2% of total installed
07 2300	Roof tiles	At least 2% of total installed
09 3000	Floor tiles	At least 2% of total installed
09 5113	Ceiling panels	At least 2% of total installed
09 6514	Base	At least 2% of total installed
09 6519	Resilient flooring	At least 2% of total installed
09 6813	Carpet	At least 2% of total installed
09 9100	Paint & Sealers	At least 2% of total installed

3.02 DELIVERY

A. Transmit all materials to the County in one submission at the completion of the Project. The Contractor is not to use the Added Stock materials for Punchlist and repairs.

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Sections of the Specifications, apply to this section.

1.02 SUMMARY

This section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

A. Inspection procedures.
B. Project record document submittal.
C. Operation and maintenance manual submittal.
D. Submittal of warranties.
E. Final cleaning.

1. Closeout requirements for specific construction activities are included in the appropriate sections.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request:

1. In the application for payment that coincides with, or first follows, the date substantial completion is claimed, show one hundred (100) percent completion for the portion of the Work claimed as substantially complete.

a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the contract sum.

b. If one hundred (100) percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Prepare and deliver to the County a completion list enumerating all items of work not complete, the work required to complete the items of work, the reason that each item is not complete, the action taken by the Contractor to complete all other work in light of the item at work remaining, and the date that the item of work will be completed.

3. Advise the County of pending insurance changeover requirements.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling the County unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

6. Submit record drawings, operation and maintenance manuals, project photographs, damage or settlement surveys, property surveys, and similar final record information.

7. Deliver tools, spare parts, extra stock, and similar items.

8. Make final changeover of permanent locks and transmit keys to the County. Advise the County's personnel of changeover in security provisions.

9. Complete startup testing of systems and instruction of the County's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mock-ups, construction tools, and similar elements.

10. Complete final cleanup requirements, including touch-up painting.

11. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the County and the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The County and the Architect will repeat inspection when requested and assured that the Work is substantially complete. If, after making such reinspection, the County determines that the work is not substantially complete, the Contractor shall be responsible for the cost

that the County and the Architect incurred in the performance of additional inspections for the purpose of determining Substantial Completion.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.04 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the contract sum.

3. Submit a certified copy of the architect's final inspection list of items to be completed or corrected, endorsed, and dated by the architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the architect.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the County took possession of and assumed responsibility for corresponding elements of the Work.

5. Submit consent of surety to final payment.

6. Submit a final liquidated damages settlement statement.

7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The County will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed.

1. Upon completion of reinspection, the County will prepare a certificate of final acceptance. If the Work is incomplete, the architect will advise the

Contractor of Work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.

2. If necessary, reinspection will be repeated, and the Contractor shall be responsible for the costs of the County and the Architect incurred in the performance of the reinspection or reinspections.

1.05 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.

2. Mark new information that is important to the County, but was not shown on Contract Drawings or Shop Drawings.

3. Note related Change-Order numbers where applicable.

4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets and print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one (1) copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.

2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.

3. Note related Record Drawing information and product data.

4. Upon completion of the Work, submit record Specifications to the architect for the County's records.

D. Record Product Data: Maintain one (1) copy of each product data submittal. Note related Change Orders and markup of Record Drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.

2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.

3. Upon completion of markup, submit complete set of record product data to the architect for the County's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the architect and the County's personnel at the Project site to determine which samples are to be transmitted to the County for record purposes. Comply with the County's instructions regarding delivery to the County's sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the architect for the County's records.

G. Maintenance Manuals: Organize operation and maintenance data as described in Section 01 78 23, Operations and Maintenance manuals.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the County's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instructions for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

C. See additional requirements for training in the specification sections.

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1, Section 01 74 23, " Final Cleaning."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal,

commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

    a. Remove labels that are not permanent labels.

    b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

    c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

    d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

    e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean and remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the project of rodents, insects, and other pests. Provide six (6) copies of each pest control inspection report to the County.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the County's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

* * *

SECTION 01 78 23

OPERATIONS AND MAINTENANCE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the data described in this Section and in other Sections of Division 1.

1.02 SUBMITTALS

A. Submit three (3) copies of a preliminary draft of the proposed Manual or Manuals to the Agency for review and comments.

B. Unless otherwise directed in other Sections, or in writing by the Agency, submit five (5) copies of the final Manual along with (1) copy of Manual on CD latest version of Word to Engineer prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUALS

A. Where Instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provisions of this Section.

B. Format:

1. Size: 8-1/2" x 11"

2. Paper: White bond, at least 20-lb. Weight

3. Test: Neatly written or printed

4. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable but to fit within the Manual and provide a drawing pocket inside rear cover or bind in with test.

5. Sheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing content of the ensuing portion; flysheets may be in color.

6. Measurements: Provide measurements in U.S. standard units such as feet and inches, lbs, and cfm; where items may be expected to be measured within ten years in accordance with metric formula, provide additional measurements in the "International Systems of Units" (SI).

C. Provide front and back covers for each Manual, using durable material approved by Engineer and clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

- name and address of Work
- name of Contractor
- general subject of this Manual
- space for approval signature of Architect and approval date

D. Contents: Include at least the following:

1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of emergency information regarding the installation.

2. Complete instructions rearing operation and maintenance of equipment.

3. Complete nomenclature of part of equipment.

4. Complete nomenclature and part number of replaceable part, name and address of nearest vendor, and all other data pertinent to procurement procedures.

5. Copy of guarantees and warranties issued.

6. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or others that are not relevant to this installation.

7. Such other data as required in pertinent Section of these Specifications.

PART 3 - EXECUTION

3.01 PREPARATION OF MANUAL

A. General

1. Prepare data in the form of an instructional Manual.

2. When multiple binders are used, correlate data into related, consistent groupings.

B. Include a directory for each product. Provide names, addresses and telephone numbers of Contractor, sub-contractor, suppliers, installers and authorized service and parts suppliers. Format as follows:

1. General Contractor: _____
   Address: _____
   Telephone No.: _____
   Person to Contact: _____

2. Subcontractor:
   Address: _____
   Telephone No.:_____
   Person to Contact: _____

3. Installer: _____
   Address: _____
   Telephone No.: _____
   Person to Contact: _____

4. Manufacturer:_____
   Address:_____
   Telephone No.: _____
   Person to Contact:

5. Local Service Representative:_____
   Address: _____
   Telephone No.: _____
   Person to Contact: _____

C. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

1. Product Data: Include only those sheets pertinent to specific product. Clearly identify pertinent data; line out inapplicable test.

2. Drawings: Supplement product data with drawings as necessary. Coordinate drawings with information in Project records Documents to ensure correct illustration of completed installation.

3. Written test, as required to supplement product data for particular installation.

4. Submittal format and content: Provide each of the following items, as applicable, for each required items or system. Requirements will vary, depending on the equipment. Refer also to specific Specification Section requirements.

5. System description: Provide a detailed narrative description of each system, describing function, components, capacities, controls and other data specified and including the following:

   a. Number of
   b. Sizes
   c. Type of operation
   d. Detailed operating instructions, including start up and shutdown of each system, with indications for position of controls, as applicable.

6. Wiring diagrams: Complete wiring diagrams for internally wired components including controls.

7. Operating sequence: Describe in detail.

8. Manufacturers' data: Provide catalog data sheets, specifications, nameplate data and parts list.

9. Preventative maintenance: Provide manufacturers' detailed maintenance recommendations.

10. Troubleshooting: Provide manufacturers' sequence for troubleshooting procedures foe operational problems.

11. Extra parts: Provide a listing of extra stock parts furnished as part of the Contract.

12. Warranties: Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins, date of expiration, name, address and telephone number of person to contact regarding problems during warranty period.

13. Provide operating and maintenance data on work required by the Scope of Work.

3.03 INSTRUCTION OF COUNTY'S PERSONNEL

A. Prior to final inspection and acceptance, instruct County's designated and maintenance personnel in operation, adjustment and maintenance of products equipment and systems.

B. Operation and Maintenance Manual shall constitute the basis of instruction.

* * *

SECTION 01 78 36

GUARANTEES AND WARRANTIES

PART 1 GENERAL

1.01 REQUIREMENTS

A. Section Includes: Requirements for the compilation and submittal of guarantees, warranties, and other documents specified.

1. Compile specified guarantees and warranties.
2. Compile specified service and maintenance contracts.
3. Co-execute submittals when so specified.
4. Review submittals to verify compliance with Contract Documents.
5. Submit to County's Representative for review with transmittal to the County.

B. Related Sections:

1. Section 01 33 00 Submittals.

1.02 SUBMITTAL REQUIREMENTS

A. General: Make submittals in accordance with the relevant requirements of Section 01 33 00.

B. Requirements:

1. Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, supplies and subcontractors.

2. Submit two original, signed copies, each.

3. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

a. Product or work item.
b. Firm, with name of principal, address and telephone number.
c. Scope.

d. Date of beginning of warranty, bond, or service and maintenance contract.
e. Duration of guarantee, warranty, or services and maintenance contract.
f. Provide information for County personnel:
   (1) Proper procedure in case of failure.
   (2) Instances which might affect the validity of guarantee or warranty.
g. Contractor, name of responsible principal, address, and telephone number.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8 1/2-inches by 11-inches, punch sheets for standard 3-ring binder.

2. Fold larger sheets to fit into binders.

3. Cover: Identify each packet with typed or printed title (GUARANTEES AND WARRANTIES).

List:
a. Title or project.
b. Name of Contractor.

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.04 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into services during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

B. Otherwise make submittals within 10 days after Date of Substantial Completion, prior to final request for payment.

C. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of guarantee/warranty period.

1.05 SUBMITTALS REQUIRED

A. Submit guarantees, warranties, and service and maintenance contracts as specified in pertinent Sections of Specification.

* * * *

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Project Record Documents required include:

1. Marked-up copies of Contract Drawings.

2. Marked-up copies of Shop Drawings.

3. Newly prepared Drawings.

4. Marked-up copies of Specifications, addenda and Change Orders.

5. Marked-up Product Data submittals.

6. Record Samples.

7. Field records for variable and concealed conditions.

8. Record information on Work that is recorded only schematically.

B. Maintenance of Documents and Samples: Store record documents and Samples in the field office apart from Contract Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and Samples available at all times for inspection by the Architect.

1.2 RECORDING

A. Record drawings shall include dimensions from not less than two permanent and salient building points.

B. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

C. The Architect will periodically review record documents to assure compliance with this requirement.

1.3 PROCEDURES

A. Promptly following Contract Award, General Contractor shall secure from the County one complete set of Specifications and prints of the Contract Drawings and mark them as "Project Record Documents."

B. Timing of Entries: Make entries within 24 hours after receipt of information.

C. Contractor shall be responsible for maintaining and recording changes on "Project Record Document" set.

D. Do not use "Project Record Documents" set for any purpose except entry of new data and for review by the Architect and County Inspector. Maintain separate job sets for subcontractors and workers daily use.

E. Maintain "Project Record Documents" set at job site where designated by the Architect.

F. Use all means necessary to protect "Project Record Documents" set from deterioration, loss or damage until completion of work.

G. Making Entries On "Project Record Documents" Drawings: Using an erasable color pencil, other than blue, not ink or indelible pencil, clearly describe change by note and by graphic line as required. Date entries. Call attention to entry by a "cloud" around area or areas affected. In even of overlapping changes, different colors may be used for each change.

1. Changes due to approved change orders may be indicated by referencing change order number and scope of change in lieu of revising "Project Record Documents".

2. Location and depth below finish grade or above ceilings and attic spaces of utilities shall be fully dimensioned and indicated on "Project Record Documents". Dimensions shall be taken to building lines of permanent landmarks.

H. The Architect's approval of current status of "Project Record Documents" will be a prerequisite to the Architect's approval of requests for progress payments and request for final payment.

1. Progress Approvals: Prior to submitting each request for progress payments, secure the County Inspector's approval of status of "Project Record Documents."

2. Prior to submitting request for final payment and final inspection, General Contractor shall submit "Project Record Documents" set to the County Inspector, with transmittal letter, in duplicate, for approval and further processing.

3. The General Contractor shall certify that the "Project Record Documents" are complete and accurately reflect all changes or modifications to the original Construction Documents.

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DOCUMENT 00 0110
TABLE OF CONTENTS

SPECIFICATIONS GROUP

General Requirements Subgroup

DIVISION 01 – GENERAL REQUIREMENTS
TO BE ISSUED BY THE OWNER

Facility Construction Subgroup

DIVISION 02 – EXISTING CONDITIONS
02 41 13 SITE DEMOLITION
02 41 20 SELECTIVE BUILDING DEMOLITION

DIVISION 03 – CONCRETE
03 30 00 CAST IN PLACE CONCRETE
03 54 16 HYDRAULIC CEMENT UNDERLAYMENT

DIVISION 04 – MASONRY
04 21 13 BRICK VENEER
04 21 13 MASONRY GENERAL GUIDELINES FOR CUTTING AND PATCHING
04 21 29.01 REMOVING GRAFFITI FROM HISTORIC MASONRY AND TILE
04 21 29.02 SEALING TERRA COTTA

DIVISION 05 – METALS
05 12 00 STRUCTURAL STEEL
05 40 00 COLD-FORMED METAL FRAMING
05 50 10 INTERIOR METAL FABRICATIONS
05 52 13 PIPE AND TUBE RAILINGS
05 73 00 DECORATIVE METAL RAILINGS

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES
06 10 00 ROUGH CARPENTRY
06 10 53 MISCELLANEOUS ROUGH CARPENTRY
06 16 43 GMF GYPSUM SHEATHING
06 40 16 INTERIOR ARCHITECTURAL WOODWORK
06 41 19 PLASTIC LAMINATE-CLAD WOOD CASEWORK
06 46 00 INTERIOR WOOD TRIM

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
07 11 13 BITUMINOUS DAMPPROOFING
07 21 50 BUILDING ENCLOSURE INSULATION
07 25 13 SHEET WEATHER-RESISTIVE BARRIERS
07 42 13 FORMED METAL PANELS
07 54 19 PVC ROOFING
07 62 00 SHEET METAL FLASHING AND TRIM
07 65 26 SASM FLASHING
07 72 00 ROOF ACCESSORIES
07 84 00 FIRESTOPPING
07 92 00 JOINT SEALANTS

DIVISION 08 – OPENINGS
08 12 13 STANDARD HOLLOW METAL FRAMES
08 13 13 STANDARD HOLLOW METAL DOORS
08 14 16 FLUSH WOOD DOORS
08 31 16 ACCESS PANELS
08 52 13 WOOD WINDOWS
08 52 14 METAL-CLAD WOOD WINDOWS
08 71 00 DOOR HARDWARE
08 81 00 GLASS GLAZING
08 83 13 MIRRORED GLASS

DIVISION 09 – FINISHES
09 05 16 PREPARATION OF CONCRETE SUBSTRATES FOR FINISH FLOORING
09 21 16 GYPSUM BOARD SHAFT WALL ASSEMBLIES
09 22 16 LIGHTGAGE METAL FRAMING
09 22 26 METAL SUSPENSION SYSTEMS
09 24 23 PORTLAND CEMENT PLASTERING
09 28 15 GMF GYPSUM TILE BACKING BOARD
09 29 00 GYPSUM BOARD
09 30 00 TILING
09 30 20 ROUTINE CLEANING AND STAIN REMOVAL OF CERAMIC TILE
09 51 13 ACOUSTICAL PANEL CEILINGS
09 62 62 METAL FLOORING TRANSITIONS
09 65 14 RESILIENT BASE
09 65 19 RESILIENT TILE FLOORING
09 68 13 TILE CARPETING
09 68 17 COMMERCIAL SHEET CARPETING
09 81 33 ACOUSTICAL INSULATION, SEALANTS, AND ACCESSORIES

09 84 15 ACOUSTICAL CEILING BAFFLES
09 91 00 PAINTING
PAINT PRODUCTS SCHEDULE
09 97 13 HIGH-PERFORMANCE STEEL COATINGS
09 97 23 PENETRATING CONCRETE FLOOR SEALER

DIVISION 10 – SPECIALTIES
10 14 13 REGULATORY SIGNAGE
10 21 13 TOILET COMPARTMENTS
10 26 00 WALL PROTECTION
10 28 13 COMMERCIAL TOILET ACCESSORIES
10 44 00 FIRE PROTECTION SPECIALTIES

DIVISION 11 – EQUIPMENT
11 31 10 CONFERENCE ROOM APPLIANCES
11 31 13 KITCHEN APPLIANCES

DIVISION 12 – FURNISHINGS
12 22 13 DRAPERIES
12 24 13 ROLLER WINDOWS SHADES
12 36 63 SOLID SURFACE MATERIAL COUNTERTOPS
12 36 64 QUARTZ AGGLOMERATE COUNTERTOPS

DIVISION 13 – SPECIAL CONSTRUCTION
13 34 19 METAL BUILDING SYSTEMS

DIVISION 14 – CONVEYING EQUIPMENT
14 24 00 HYDRAULIC ELEVATORS

Facility Services Subgroup

DIVISION 21 – FIRE SUPRESSION
21 13 13 FIRE SUPPRESSION SPRINKLER SYSTEM

DIVISION 22 – PLUMBING
22 05 00 COMMON WORK RESULTS FOR PLUMBING
22 05 13 BASIC PLUMBING MATERIALS AND METHODS
22 05 53 PLUMBING IDENTIFICATION
22 07 00 PLUMBING INSULATION
22 10 00 PLUMBING

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING
23 00 00 MECHANICAL HEATING VENTILATION AND AIR CONDITIONING
23 05 00 MECHANICAL COMMON WORK
23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

23 05 48 MECHANICAL SOUND VIBRATION AND SEISMIC CONTROL
23 05 53 MECHANICAL IDENTIFICATION
23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC
23 07 00 MECHANICAL INSULATION
23 08 00 MECHANICAL SYSTEMS COMMISSIONING
23 09 00 HVAC INSTRUMENTATION CONTROLS
23 30 00 MECHANICAL AIR DISTRIBUTION
23 31 13 MECHANICAL METAL DUCTS
23 33 00 AIR DUCT ACCESSORIES
23 80 00 HEATING VENTILATING AND AIR CONDITIONING EQUIPMENT
23 80 01 HEAT PUMP VARIABLE REFRIGERANT FLOW EQUIPMENT
23 81 26 SPLIT SYSTEM AIR CONDITIONERS

DIVISION 25 – INTEGRATED AUTOMATION (NOT INCLUDED)

DIVISION 26 – ELECTRICAL
26 02 00 LOW VOLTAGE TRANSFORMERS
26 05 00 COMMON WORK RESULT FOR ELECTRICAL
26 05 11 REQUIREMENTS FOR ELECTRICAL INSTALLATIONS
26 05 13 MEDIUM VOLTAGE CABLES
26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING
26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33 RACEWAYS BOXES FITTINGS AND SUPPORTS
26 05 43 UNDERGROUND DUCTS AND RACEWAYS ELECTRICAL SYSTEMS
26 05 44 SLEEVES SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
26 05 48 VIBRATION AND SEISMIC CONTROL FOR ELECTRICAL SYSTEMS
26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 05 63 ELECTRICAL TESTING
26 05 72 OVERCURRENT PROTECTIVE DEVICE SHORT CIRCUIT STUDY
26 05 73 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY
26 08 00 ELECTRICAL SYSTEMS COMMISSIONING
26 09 23 LIGHTING CONTROL SYSTEMS
26 09 43 NETWORK LIGHTING CONTROL SYSTEMS
26 13 13 MEDIUM VOLTAGE METAL CLAD SWITCHGEAR
26 13 16 MEDIUM VOLTAGE FUSIBLE INTERRUPTER SWITCH
26 23 00 LOW VOLTAGE SWITCHGEAR

26 24 13 SWITCHBOARDS
26 24 16 PANELBOARDS
26 25 00 ENCLOSED BUS ASSEMBLIES
26 27 26 WIRING DEVICES
26 28 13 FUSES
26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 33 53 STATIC UNINTERRUPTIBLE POWER SUPPLY
26 36 00 AUTOMATIC TRANSFER SWITCHES
26 43 13 SURGE PROTECTIVE DEVICES
26 51 00 INTERIOR LIGHTING
26 53 00 EXIT SIGNS
26 56 00 EXTERIOR LIGHTING

DIVISION 27 – COMMUNICATIONS

27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS
27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATION SYSTEMS PART
27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATION SYSTEMS
27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
27 05 39 SURFACE RACEWAYS FOR COMMUNICATIONS SYSTEMS
27 05 43 UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS SYSTEMS
27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
27 10 00 STRUCTURED CABLING, BASIC MATERIALS AND METHODS
27 11 16 COMMUNICATION CABINETS, RACKS, FRAMES AND ENCLOSURES
27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS
27 11 23 COMMUNICATIONS CABLE MANAGEMENT
27 13 00 COMMUNICATIONS INDOOR BACKBONE CABLING
27 15 00 COMMUNICATIONS HORIZONTAL CABLING
27 52 25 PORTABLE ASSISTIVE LISTENING SYSTEM

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
28 10 00 ACCESS CONTROL SYSTEM
28 20 00 VIDEO SURVEILLANCE
28 31 00 FIRE ALARM AND DETECTION SYSTEM

Site and Infrastructure Subgroup

DIVISION 31 – EARTHWORK
31 22 00 GRADING
31 23 02 EXCAVATION AND FILL FOR UTILITIES
31 23 04 EXCAVATION AND FILL FOR STRUCTURES
31 25 00 EROSION AND SEDIMENTATION CONTROLS

DIVISION 32 – EXTERIOR IMPROVEMENTS
32 12 16 ASPHALT CONCRETE PAVING
32 13 13 SITE CONCRETE WORK
32 17 00 PAVEMENT MARKINGS AND BUMPERS
32 17 19 PAVEMENT MARKINGS AND WHEEL STOPS
32 17 26 TACTILE WARNING SURFACING
32 31 19 FABRICATED DECORATIVE METAL FENCES AND GATES
32 31 43 AUTOMATIC GATE OPERATORS
32 39 13 MANUFACTURED METAL BOLLARDS
32 84 23 IRRIGATION SYSTEM
32 93 00 PLANTS

DIVISION 33 – UTILITIES
33 05 28 UNDERGROUND UTILITIES MARKING
33 10 00 SITE WATER DISTRIBUTION SYSTEM
33 30 00 SANITARY SEWAGE SYSTEM
33 40 00 STORM DRAINAGE SYSTEM

END TABLE OF CONTENTS
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DIVISION 02

EXISTING CONDITIONS

SECTION 02 4113

SITE DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal as indicated on Drawings and as required to accommodate new work, including, but not limited to:

1. Saw-cutting and removal of asphalt concrete paving.
2. Saw-cutting and removal of curbs and planter walls.
3. Removal of electrical items, including lights, boxes, vaults, audio boxes, and cables.

B. Salvage of existing materials, products, and equipment as indicated on Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 31 Section "Grading".

B. Division 32 Section "Asphalt Concrete Paving".

C. Division 32 Section "Site Concrete Work".

1.3 PROJECT CONDITIONS

A. Dust control:

B. Use all means necessary to prevent the spread of dust during performance of work. Thoroughly allay dust at all times.

C. Use of reclaimed water shall conform to requirements and guidelines of governing health authorities and be specifically approved by Owner.

D. Burning on-site: Not permitted.

E. Protection: Use all means necessary to protect existing objects designated to remain, including structures, utilities, flora, and trees. In the event of damage to existing objects designated to remain, repair or replace objects to satisfaction of Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials, equipment, shoring, and appurtenances of every kind required for completion of demolition work, including barricades, handrails, and waste receptacles.

B. Explosives: Not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces for conditions that will adversely affect execution, permanence, and quality of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Job site examination**:**

1. Prior to commencing work, examine entire job site for objects designated to be removed and protected, and limits of demolition.
2. Locate existing active utility lines and provide for their protection.

B. Clarification:

1. Drawings do not indicate all objects existing on job site.
2. Before commencing work, verify with Owner which objects are to be removed by Contractor, which objects are to be removed by Owner, and which objects are to be preserved.

C. Scheduling:

1. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

D. Protection of utilities:

1. Preserve and maintain in operating condition all active utilities traversing site. Reroute, or remove and cap those which interfere with work of this Project. Coordinate extent of work with Owner.
2. Expeditiously repair damaged utilities at no cost to Owner.

E. Protection of flora:

1. Construct a physical barrier between existing flora to remain and area of new construction.
2. Protect existing trees, not otherwise indicated to be removed, against unnecessary cutting, or breaking, skinning, bruising of bark. Avoid smothering trees with stockpiled building materials or excavated materials within the drip line. Avoid excess pedestrian or vehicular traffic and parking vehicles within drip line.

3.3 DEMOLITION AND REMOVAL

A. Demolition and removal of materials shall be done by skilled and properly equipped workers. Materials and equipment to be salvaged shall be removed under the direction of or by craftsperson who would normally install such items.

B. Cut concrete and asphalt concrete slabs, walks, pavement, and curbs with a concrete saw to a 2-inch depth along all joint lines before breaking out the portion to be removed.

C. Demolish and remove all foundations, walls, concrete slabs, asphalt concrete pavement, and other items designated for removal, or which are necessary to be removed to make way for new construction work.

3.4 SALVAGE

A. All materials removed shall become the property of Contractor to dispose of or salvage, with the exception of items designated on Drawings to be subsequently reinstalled or returned to Owner or items "tagged" as salvage for return to Owner and not previously removed by Owner.

B. Identify (tag or similarly mark indelibly in an inconspicuous location) each salvage item, including detached component parts, with an extensive description of salvage item or component part's use, installed location, date of removal, and similar pertinent information as may be required for reinstallation or future reference by Owner. For salvage items not reinstalled in the Work, box, package or otherwise protect, and transport to Owner-designated locations.

C. Dispose of all materials.

D. Do not sell salvage materials to the general public at job site. This shall not preclude sale to and removal from job site of salvage materials to duly licensed salvage companies.

E. Temporarily store removed materials for subsequent reinstallation at confined areas designated by Owner. Carefully handle removed materials to prevent damage to areas outside immediate locations of the Work.

3.5 DISPOSAL

A. Except as specified otherwise, load debris resulting from demolition and removal as it accumulates, haul away from site promptly, and dispose of in a legal manner.

B. Prevent debris from migrating outside of construction areas. Use Owner-approved methods and materials to confine debris to construction areas. Failure to contain demolition debris is not permitted.

END OF SECTION

SECTION 02 4120
SELECTIVE BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Systematic removal of portions of buildings and structures.
2. Salvage of existing items for reuse.
3. Salvage of construction materials for recycling.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Remove: Means to detach from existing construction and legally dispose off-site.
2. Demolish: Means the same as “remove”.
3. Dispose: Means to get rid of by throwing away; or by giving or selling to someone else.
4. Reuse: Means to use again for the same function without re-processing.
5. New-Life Reuse: Means to use again for a different function without re-processing.
6. Remove and Salvage: Means to detach from existing construction, prepare for reuse or storage as applicable, and then deliver to the Owner.
7. Remove and Reinstall: Means to detach from existing construction, prepare for reuse, and reinstall where indicated.
8. Recycle: Means to detach from existing construction, break down into raw materials, and then process the materials to make new items.
9. Existing-to-Remain: Means existing items that are not removed, reused, or recycled.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Demolition drawings are diagrammatic and show existing conditions with information developed from field surveys and to generally show the extent and type of demolition required. The Owner will maintain conditions existing at the time of inspection for bidding purposes as far as practicable.

1. Before beginning demolition, make a detailed survey of existing conditions indicated below in Part 3 of this specification Section, and report discrepancies or conflicts between Drawings and actual conditions in writing to the Architect for clarifications and instructions.
2. Do not proceed, when such conflicts or discrepancies occur, before receipt of the Architect's instructions.

B. Pre-Demolition Meeting:

1. To review methods and procedures related to the work of this specification Section, hold a meeting at the project site after submittal approval and at least 10 business days before beginning installation. At a minimum, the Contractor, demolition subcontractor, and Architect must attend the meeting.
2. During the meeting, review the Contract Documents, submittals, project conditions, and demolition sequence and methods, including special details and conditions that might affect demolition.
   a. Review and discuss existing conditions survey indicated below in Part 3 of this specification Section.
   b. Inspect and discuss condition of construction to be selectively demolished.
   c. Review structural load limitations of existing structure.
   d. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   e. Review requirements of work that rely on substrates exposed by selective demolition operations.
   f. Review areas where construction is existing-to-remain and requires protection.
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting or demolishing construction. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin demolition until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Informational Submittals:

1. Schedule of Selective Demolition Activities: Indicate the following.
   a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   b. Interruption of utility services. Indicate how long utility services will be interrupted.
   c. Coordination for shutoff, capping, and continuation of utility services.
   d. Use of elevator and stairs.
   e. Locations of proposed dust- and noise-control temporary partitions and means of egress.
   f. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed work.
   g. Means of protecting existing-to-remain items in the path of waste removal.
2. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
3. Pre-Demolition Photographs or Videos: Submit videos or photographs showing existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

1.5 QUALITY ASSURANCE

A. Quality Standards: Comply with the safety requirements of both American National Standards Institute/ American Society of Safety Engineers publication ANSI/ASSE A10.6. "*Safety Requirements for Demolition Operations*" and National Fire Protection Association publication NFPA 241, "*Standard for Safeguarding Construction, Alteration, and Demolition Operations*".

1.6 PROJECT CONDITIONS

A. Hazardous Materials: Hazardous materials may be encountered in the building or at the project site. If materials suspected of containing hazardous materials are encountered, then do not disturb; promptly notify the Architect and Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure adequate supervision practices are followed at the project site before demolition work begins and at all times during installation.

B. Survey: Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

1. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
2. Provide means to have digital molds created to repair ornate items in case of loss (e.g., laser cloud point scan).
3. Inventory and record the condition of items removed and reinstalled and removed and salvaged.
4. When unforeseen mechanical, electrical, or structural elements are encountered that conflict with intended function or design, investigate and measure the nature and extent of conflict. Promptly submit written report to Architect.
5. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

A. Site Protection: Protect existing-to-remain sitework against damage and soiling during demolition.

1. Do not begin selective demolition work until temporary partitions, barricades, warning signs, and other forms of protection are installed.
2. Protect trees, plants, utilities, and existing improvements that are not to be removed from injury or damage. Replace damaged landscaping, improvements, and utilities in kind.
3. During demolition, provide safeguards for protection of the public, Contractor's employees, and existing improvements existing-to-remain, including warning signs and lights, barricades, and the like.
4. Provide and maintain shoring, bracing, and structural supports required to preserve stability and prevent movement, settlement, or collapse of existing-to-remain construction and finishes; and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

B. Building Protection: Protect existing-to-remain building construction against damage and soiling during selective demolition.
   1. Do not begin selective demolition work until temporary building bracing, barricades, and other protection necessary to prevent injury to people and damage to adjacent existing-to-remain facilities.
   2. Do not allow water to enter existing-to-remain wall or roof insulation. Replace insulation when it is wetted.
C. Utilities, Services, and Building Systems Protection:
   1. Maintain existing-to-remain utility services and mechanical and electrical systems and protect them against damage during selective demolition operations.
   2. Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical and electrical systems serving areas indicated for demolition.
      a. Arrange with utility companies to shut off indicated utilities.
      b. If building systems or mechanical and electrical systems are indicated as removed, relocated, or abandoned, provide temporary services and systems that bypass demolition areas and maintain continuity of services and systems to other parts of building before proceeding with selective demolition.
      c. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 DEMOLITION

A. General Demolition Requirements:
   1. Coordinate demolition to assure the proper sequence, limits, methods, and time of performance. Schedule demolition to impose minimum of hardship on present facility operations and performance of the work.
   2. Conduct selective demolition and debris-removal operations to ensure the least interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   3. Demolish and remove existing construction only as shown and to the extent required by new construction. Use methods necessary to complete the work within indicated or specified limitations.
      a. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not shown as demolished; do not demolish existing construction beyond indicated limits.

b. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not shown as demolished.
c. Do not demolish existing construction beyond indicated limits.

4. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage existing-to-remain construction or adjoining construction.
5. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces.
6. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces. Verify condition and contents of hidden space before starting cutting operations.
7. Do not use cutting torches until after work areas are cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
8. Temporarily cover existing-to-remain openings.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Do not remove any item in a manner that that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Removed and Salvaged Items:
   a. Clean salvaged items.
   b. Pack or crate items after cleaning. Identify contents of containers.
   c. Store items in a secure area or location until delivery to the Owner.
2. Removed and Reinstalled Items:
   a. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   b. Pack or crate items after cleaning and repairing. Identify contents of containers.
   c. Protect items from damage during transport and storage.
   d. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3. Existing-to-Remain Items:
    a. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 CORRECTION AND REPAIR

A. Damaged existing-to-remain work must be patched and repaired. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
    1. written descriptions of non-conforming, damaged, and defective work;
    2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
    3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Do not correct, repair, or replace any item in a manner that that results in any warranty or guarantee becoming void.

D. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Except for recycled, reused, salvaged, and reinstalled items and other existing-to-remain items on Owner's property, remove demolished materials from the project site and legally dispose off-site. Do not burn demolished materials.

B. Removed items not indicated for reuse, reinstallation, or salvage are the property of the Contractor and must be cleared from the project site.
    1. Continuously clean up and clear these items; do not allow them to accumulate in the building or at the project site.
    2. Material and equipment may not be viewed by prospective purchasers nor sold on the site.
    3. The Owner is not responsible for the condition, loss, or damage to removed items.

C. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 03

CONCRETE

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES CAST-IN-PLACE CONCRETE, INCLUDING FORMWORK, REINFORCEMENT, CONCRETE MATERIALS, MIXTURE design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.

2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice”.

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M.
2. Fly Ash: ASTM C 618.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: As noted.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. WATER: ASTM C 94/C 94M AND POTABLE.

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete:

1. Minimum Compressive Strength: As noted.
2. Maximum W/C Ratio: As noted.
3. Slump Limit: As noted.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice”.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.
2. Finish surface with a cork float

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces [indicated] [and] [to receive concrete floor toppings] [to receive mortar setting beds for bonded cementitious floor finishes] <Insert locations>.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces [indicated] [to receive trowel finish] [and] [to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo] <Insert locations>.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces [indicated] [exposed to view] [or] [to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system] <Insert locations>.
2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed [1/4 inch (6 mm)] [3/16 inch (4.8 mm)] [1/8 inch (3.2 mm)].

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces [indicated] [where ceramic or quarry tile is to be installed by either thickset or thinset method]. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

E. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless

manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

1. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

SECTION 03 5416
HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydraulic cement underlayment.
2. Patching material.
3. Surface preparation.
4. Installation materials.
5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the cement underlayment manufacturer, unless otherwise indicated.
2. Underlayment: Means a material installed over subfloors to help achieve specified floor flatness values, and to smooth and correct surface irregularities prior to flooring installation

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected cement underlayment with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
2. Proposed substitution requests and submittals that change the quality (grade) or the generic chemistry of specified cement underlayment are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the cement underlayment manufacturer.

4. Coordinate cement underlayment primers with concrete curing compounds.
    a. When accepted in writing by the manufacturer's field representative, specified cement underlayment may be applied over concrete slabs treated with either a silicate or acrylic resin curing compound.
    b. Wax- and petroleum-based emulsions are permanent bond breakers that must be completely removed by mechanical means prior to patching or leveling.
    c. Dissipating compounds must be completely removed by mechanical means prior to patching or leveling.
    d. In all cases, acid etching, adhesive removers, solvents, and sweeping compounds are prohibited.
5. When covering plywood or OSB subfloor sheathing with cement underlayment, additional measures must be taken to avoid concrete topping or concrete mix water leaching into subflooring. (concrete topping and concrete toppings seal the upper surface and moisture must travel through the full depth of subflooring to escape, which may delay ceiling finish installation to avoid trapping moisture within the assembly)
6. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
    a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
    b. assume the manufacturer-recommended coverage rates govern; and
    c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

B. Sequencing:
1. Install cement underlayment only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with cement underlayment; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible surface treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
2. Install cement underlayment only after penetrating items are installed.

C. Scheduling:
1. Concrete Substrate Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.

2. Primer Installation: Cement underlayment must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
3. Finishing Flooring Installation: Do not install floor coverings until after the minimum time recommended in writing by the manufacturer has passed.
4. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling load traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs),both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished cement underlayment.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Cement underlayment must be obtained through one source from the same manufacturer (to ensure compatibility and a warrantable installation).
      a. Certain cement underlayments may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing cement underlayment for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing cement underlayment for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading cement underlayment installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective cement underlayment materials with undamaged new cement underlayment materials that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install cement underlayment only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
B. Existing Conditions:
   1. Surface Conditions: Install cement underlayment only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide products manufactured by one of the following, or equal.
   1. ARDEX Group.
   2. Custom Building Products.
   3. Floor Seal Technology, Inc.
   4. LATICRETE International, Inc.
   5. Mapei Corp.

2.2 HYDRAULIC CEMENT UNDERLAYMENT

A. Description: Portland-cement-based, non-structural, engineered cementitious material specifically designed for use as interior flooring cement underlayment. Products with added gypsum are prohibited.

B. Application: Installed over subfloors to help achieve specified floor flatness values; and to smooth and correct surface irregularities prior to flooring installation.

C. Self-Leveling Products:

1. Pourable Grade Cement Underlayment Applications (0 to 1-1/4 inches thick): “ARDEX V-1200” self- leveling, no-troweling cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.

2. High-Flow Cement Underlayment Applications (1/16- to 1/2-inch thick): “ARDEX K 10” reactivatable high-flow, self-leveling cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.

3. Thicker Cement Underlayment Applications (1/4-inch to 5 inches thick): “ARDEX K 15” self-leveling polymer-modified cement underlayment manufactured by ARDEX Americas, or equal. Primer is required.

   a. For application thickness between 1/4-inch and 1-1/2 inches thick, apply neat.

   b. For application thickness between 1-1/2 and 5 inches thick, apply with aggregate.

4. Fiber Reinforced Underlayment Applications (1/4-inch to 5 inches thick): “ARDEX K 22 F” high-flow, fiber-reinforced, self-leveling underlayment manufactured by ARDEX Americas, or equal. Primer is required.

   a. For application thickness between 1/4-inch and 1-1/4 inches thick, apply neat.

   b. For application thickness between 1-1/4 and 2 inches thick, apply with aggregate.

D. Trowel Grade Products:

1. Non-Structural Repair, Re-Slope, and Re-Forming Material: “ARDEX CP” Portland cement-based concrete topping for filling and repairing indoor and outdoor concrete flatwork manufactured by ARDEX Americas, or equal.

2. Structural Repair Mortar: “ARDEX ERM” Polymer modified structural repair mortar with integral corrosion inhibitor manufactured by ARDEX Americas, or equal.

2.3 PATCHING MATERIAL

A. Patching Compound: “ARDEX SD-F Feather Finish” self-drying finishing cement underlayment manufactured by ARDEX Americas, or equal. Primer is typically not required.

2.4 SURFACE PREPARATION

A. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.

B. Concrete Surface Profiling: Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the covering manufacturer. Conform to the requirements of Section 09 05 16.

2.5 INSTALLATION MATERIALS

A. Primers:

1. Standard Absorbent Concrete, Gypsum, and Other Porous Substrates (in Specialized Applications): “ARDEX P 51” manufactured by ARDEX Americas, or equal.
   a. Two applications of primer must be applied over gypsum cement underlayment.
   b. Two applications of primer may be required over absorbent concrete cement underlayment.
2. Wood, Cutback Residue, Metal, and Other Non-Porous Substrates: “ARDEX P 82 ULTRA PRIME” manufactured by ARDEX Americas, or equal.

B. Additive: “ARDEX E 25” resilient emulsion manufactured by ARDEX Americas, or equal, for use over cutback and other adhesive residues on concrete subfloors only; over metal; and as part of mesh-reinforced wood subfloor systems.

C. Crack Repair Compound: “ARDEX ARDIFIX” 100-percent solids, 2-part polyurethane repair compound manufactured by ARDEX Americas, or equal, for repair of non-moving joints and cracks.

D. Joint Filler: “ARDEX ARDISEAL Rapid Plus” 2-part, self-leveling, semi-rigid polyurea joint filling compound manufactured by ARDEX Americas, or equal, for repair of all moving joints.

E. Sand: Washed masonry or plaster sand, 1/8-inch diameter and smaller.

F. Aggregate: Well-graded washed gravel, 1/8- to 1/4-inch diameter or larger, supplied, required, recommended, or accepted by the manufacturer for proposed thicknesses.

G. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect cement underlayment quality, durability, or performance.

2.6 ACCESSORIES

A. Perimeter Isolation Strips: Supplied, required, recommended, or accepted by the manufacturer.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.7 MIXING

A. Site Mixing: Batch mix cement underlayment in conformance with manufacturer's instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.

1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment and are prohibited from measuring or dispensing mix materials.
2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
3. Do not reduce, alter, or introduce foreign materials into mix materials, , including primers, additives, compounds, and fillers, except in conformance with manufacturer's instructions and other requirements and recommendations.
4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.

3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with cement underlayment adhesion or performance.
4. Verify items penetrating cement underlayment are installed.

C. Evaluation and Assessment:
1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:
1. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
2. Opening Protection: Close and protect drains and other openings and penetrations to prevent cement underlayment intrusion or migration.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
1. Remove substrate coatings and other substances that are incompatible with cement underlayment or that may negatively affect the quality of installation, durability, or performance.
2. Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16. Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the manufacturer.
3. Repair damaged sub-floor and fill cracks.
4. Vacuum-clean substrate.

3.3 INSTALLATION

A. General Requirements:
1. Install cement underlayment using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Remove and replace cement underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3. Installed cement underlayment must be warrantable. Do not install, correct, or replace cement underlayment in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Thickness: Install screeds as required, recommended, or accepted by the manufacturer.
   a. Set screeds with a laser level so the minimum cement underlayment thickness is at least 1/8-inch.
   b. Where cement underlayment covers only a small area, grind, chisel, and undercut floor and deck slabs as necessary to ensure a minimum cement underlayment thickness of at least 1/8-inch.
2. Place cement underlayment in one continuous operation, without cold joints, to produce uniform and level surfaces.
   a. Screed cement underlayment to levels and tolerances required, recommended, or accepted by the finish flooring manufacturer.
   b. Feather edges to match adjacent floor elevations.
3. Cure cement underlayment in conformance with the manufacturer's instructions. Protect cement underlayment to prevent contamination during installation and curing.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, and soiling from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 04

MASONRY

SECTION 04 2113
BRICK VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Face brick.
   2. Mortar and grout.
   3. Masonry joint reinforcement.
   4. Ties and anchors.
   5. Embedded flashing.
   6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Supplier: Means the veneer supplier, unless otherwise indicated.
   2. Manufacturer: Means the installation material or accessory manufacturer, as the context admits, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: For manufactured items, submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), which are returned to the Contractor without review or responsive action.
   2. Shop Drawings:
      a. Submit dimensioned elevations drawn to scale and showing wall design patterns and layouts.
      b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to elevations.
   3. Samples: Submit at least 12-inch square representative samples of each veneer variety for each specified color and finish, glued to hardboard backing. Grout all joints with specified grout.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished veneer installation materials and accessories.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
C. Maintenance Material Submittals: Before Final Completion, deliver to the Owner veneer cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
   1. Furnish at least 2 percent of the total installed for each veneer type, color, composition, grade, finish, and variety.
   2. Furnish at least 2 percent of the total amount installed for each grout type, color, and composition. but not less than one unopened container.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Veneer must be obtained through one source from the same supplier (to ensure compatibility and appearance).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
B. Quality Standards:
   1. Installation Standards: Comply with parts of ANSI A108 Series publications that apply to types of setting and grouting materials and to installation methods indicated.

2. Installation Guidelines: Comply with TCNA publication "*Handbook for Ceramic, Glass, and Stone Installation"* requirements for installation methods indicated.

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Supplier: Company or individuals must have experience supplying veneer for previous projects similar to this project in size, material, design, and complexity.
2. Manufacturer: Company or individuals must have experience manufacturing installation materials and accessories installed on previous projects similar to this project in size, material, design, and complexity.
3. Installer: Company or individuals must have experience installing veneer for previous projects similar to this project in size, material, design, and complexity.
4. Supervisors: Individuals must have experience installing veneer for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading veneer installers.

D. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of veneer is made from field samples.
3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Existing Conditions:

1. Substrate Dimensional Tolerances: Surfaces receiving veneer must be flat with 1/4-inch within any 10-foot radius.
2. Deflection: Maximum deflection of substrate system under positive or negative design loads must not exceed L/960 of span for stone veneer.

PART 2 - PRODUCTS

2.1 FACE BRICK

A. Manufacturers: Provide products manufactured by the manufacturer indicated in the Product Selection Schedule on the A900 Series Drawings, or equal product manufactured by the following.

1. H.C. Muddox.

B. Color: Indicated on the Drawings.

C. Shapes: Provide shapes indicated on the Drawings and as follows.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

D. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement-Lime Mix: Packaged blend of Portland cement conforming to ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

B. Mortar Pigments:

1. Description: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

2. Products: Provide “True Tone” mortar colors manufactured by Davis Colors, or equal.
3. Mortar Color: Match existing adjacent buildings on campus.

C. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

D. Aggregate for Grout: ASTM C 404.

E. Water: Potable.

2.3 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with the subparagraphs below, unless otherwise indicated.
1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
2. Stainless-Steel Sheet: ASTM A 666, Type 304.

B. Manufacturers: Provide Hohman Barnard Anchoring System, or equal.

C. Adjustable Masonry-Veneer Anchors
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
2. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.
a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical leg of connector section.
b. Connector Section: Rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
c. Fabricate sheet metal anchor sections and other sheet metal parts from 0.109-inch- thick, stainless-steel sheet.

3. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads. Products:
    a. Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener.
    b. ITW Buildex; Scots long life Teks.
    c. Or equal.

2.4 EMBEDDED FLASHING MATERIALS

A. Metal Flashing:
    1. Fabricate continuous flashings in sections at least 96 inches long minimum, but not exceeding 10 feet. Provide splice plates at joints of formed, smooth metal flashing.
    2. Provide preformed 0.0359-inch (USSG 20) stainless steel waterproofing extension "collars" at perimeter of all door and window openings.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.5 ACCESSORIES

A. Compressible Filler: Pre-molded filler strips conforming to ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

B. Weep Vent: Provide “342 Rectangular Plastic Weep Holes” rectangular profile plastic weep holes, no cotton wick, with metal mesh screen manufactured by Hohmann & Barnard, Inc., or equal.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
    1. Provide strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
    2. Products:
        a. Advanced Building Products Inc.; Mortar Break.
        b. Archovations, Inc.; CavClear Masonry Mat.
        c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
        d. Mortar Net USA, Ltd.; Mortar Net.
        e. Or equal.

D. Tape Sealants: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.

E. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 MIXING

A. Site Mixing: Batch mix installation materials in conformance with manufacturer's instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.

1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment and are prohibited from measuring or dispensing mix materials.
2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
3. Do not reduce, alter, or introduce foreign materials into mix materials, except in conformance with manufacturer's instructions and other requirements and recommendations.
4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations, including dimensional tolerances and deflection criteria.
2. Verify items penetrating veneer is installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.

2. Perform or arrange and pay costs for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install veneer using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set veneer to line; plumb, level, and square without warp or rack; with flush, well-fitted joints and in alignment with adjacent construction
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed veneer must be warrantable. Do not install, correct, or replace veneer in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Waterproofing/Crack Prevention Membrane Installation:
   a. Install waterproofing/crack prevention membrane to comply with ANSI A108.13 and the waterproofing/crack prevention manufacturer’s written instructions to produce membrane of uniform thickness bonded securely to substrate.
   b. Do not install stone veneer over waterproofing/crack prevention membrane until membrane has cured and been tested to determine that it is watertight.
2. Veneer Installation:
   a. Install veneer in conformance with the ANSI and TCNA quality standard publication requirements for wall installations.
   b. Accurately form intersections and returns. Perform cutting and drilling without marring visible surfaces. Carefully grind cut edges abutting trim, finishes, or built-in items for straight aligned joints. Fit veneer closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap veneer.

c. Jointing Pattern: Lay veneer in patterns as indicated on the Drawings.
d. Ensure veneer is the same size and joints align when veneer is installed against stone on floors, bases, walls, and trim.
e. Lay out and center veneer in both directions in each space or on each wall area. Adjust to minimize cutting.
f. Provide uniform joint widths, unless otherwise indicated.

3. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, during installation.
   a. Locate joints in veneer surfaces directly above joints in concrete substrates.
   b. Prepare joints and apply sealants in conformance.
   c. Do not saw-cut joints after installing stones
4. Grout veneer in conformance with the ANSI and TCNA quality standard publication requirements.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere veneer to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible veneer surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed veneer in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed veneer unless they are protected from damage, as accepted in writing by the Architect. Do not use installed veneer as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 04 21 13 -1

MASONRY GENERAL GUIDELINES FOR CUTTING AND PATCHING

PART 1- GENERAL

1.01 SUMMARY

This specification provides general guidelines to follow when performing cutting and patching in original work.

1.02 **DEFINITIONS**

A. "Cutting and patching" refers to cutting into existing construction to provide for the installation or performance of other work, and the subsequent fitting and patching required to restore surfaces to their original condition.

1. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed, or for other similar purposes.

2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition.

3. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".

B. "Selective Demolition" is recognized as related but separate category of work, which may or may not include cutting and patching as defined in this specification.

1.03 **SUBMITTALS**

Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed, and request approval to proceed. Include the following information, as applicable, in the submittal.

A. Describe nature of the work and how it is to be performed, indicating why cutting and

patching cannot be avoided.

B. Describe anticipated results of the work in terms of changes to the existing site conditions, including structural, operational and visual changes, as well as how historic materials or other significant elements may be affected by the proposed cutting and patching.

C. List products to be used, and firms (including their qualifications), that will perform the work.

D. Give dates when the work is expected to be performed.

E. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be temporarily out of service.

F. If utility service will be disrupted, an estimated time that it will be out of operation must be included in the proposal.

G. When cutting and patching of structural work involves the substitution, movement, removal or addition of structural elements or reinforcement of any kind, submit engineering details and calculations that have been signed and stamped by a suitably experienced and licensed professional to show how the new work is integrated with the original structure to satisfy the requirements of the undertaking.

H. Indicate changes to designated landmark areas or highly rated HBPP zones.

I. All welding and hot work require formal, written notification to the Building Manager no later than the first thing in the morning of each day such work is to be done. No welding or hot work is permitted without such prior notification.

1.04 **QUALITY ASSURANCE**

A. The General Contractor shall do all cutting and patching of wall and ceiling surfaces for the removal, relocation or installation of new piping, conduit, electrical boxes, asbestos abatement, PCB removal.

B. Cutting which will disturb the asbestos material shall be done under the direction of the Asbestos Abatement Subcontractor and be properly documented in writing.

C. Cutting and patching of all nonstructural concrete floors for mechanical and electrical work shall be done by the respective subcontractors in accordance with the provisions of this section, under the supervision of the General Contractor.

D. Cutting and patching of all walls for ducts shall be done by the Mechanical Subcontractor in accordance with the provisions of this section, under the supervision of the General Contractor.

E. Requirements for Structural Work:

1. As in 1.03.F above, when cutting and patching of structural work involves the substitution, movement, removal or addition of structural elements or reinforcement of any kind, submit engineering details and calculations that have been signed and stamped by a suitably experienced and licensed professional to show how the new work is integrated with the original structure to satisfy the requirements of the undertaking.

2. Cutting and patching structural work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio is not acceptable. All work must have the written approval of project's Structural Engineer in advance.

3. Before cutting and patching the following categories of work, obtain approval to proceed from both the GSA Contracting Officer and the GSA Regional Historic Preservation Officer:

    a. Structural steel

    b. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work

    c. Structural concrete

    d. Foundation construction

    e. Timber and primary wood framing

f. Structural decking

g. Bearing and retaining walls

h. Piping, ductwork, vessels and equipment

i. Shoring, bracing, and sheeting

j. Primary operational systems and equipment

k. Water/moisture/vapor/air/smoke barriers, membranes and flashings

l. Noise and vibration control elements and systems

m. Control, communication, conveying, and electrical wiring systems, including fire and life safety systems

F. Visual Requirements:

1. Do not cut and patch work exposed on the building's exterior or in its occupied spaces in a manner that would, in the Contracting Officer's opinion, result in lessening the building's aesthetic qualities.

2. Do not cut and patch in a manner that would result in substantial visual evidence of cut and patch work. Any work judged by the Contracting Officer to be done in a visually unsatisfactory manner must be removed and replaced.

G. Retain a recognized, experienced, and specialized firm to cut and patch the following categories of exposed work.

1. Processed concrete finishes

2. Stonework and stone masonry

3. Ornamental metal

4. Matched-veneer woodwork 5.Roofing

6. Stucco and ornamental plaster

7. Terrazzo

8. Finished wood flooring

9. Carpeting

10. Wall covering

11. HVAC enclosures, cabinets, or covers

PART 2-PRODUCTS

2.01 **MATERIALS**

A. Except as otherwise indicated, or as directed by the Contracting Officer, materials for cutting and patching must be identical to existing materials.

B. If identical materials are not available or cannot be used, use pre-approved materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect.

C. Use materials for cutting and patching that will result in equal-or-better performance characteristics in comparison to the original.

PART 3-EXECUTION

3.01 EXAMINATION

A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed.

B. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

C. Before the start of cutting work, meet at the worksite with all parties involved in cutting and patching, including mechanical and electrical trades.

1. Review areas of potential interference and conflict between the various trades.

2. Coordinate layout of the work and resolve potential conflicts before proceeding.

3.02 **PREPARATION**

A. Temporary Support: Provide adequate temporary support during cutting and patching so as to prevent damage work to be retained or adjoining work.

B. Protection:

1. Protect adjoining surfaces during cutting and patching to prevent damage.

2. Provide protection from cold and moisture as directed by the patching product manufacturer.

3. Avoid interference with the use of adjoining areas or interruption of free passage to adjoining areas to the extent possible given the scope of work.

4. Utilize safe workplace practices.

3.03 **ERECTION, INSTALLATION, APPLICATION**

A. General:

1. Employ workers skilled in cutting and patching to do said work.

2. Except as otherwise indicated or as approved by the Contracting Officer, proceed with cutting and patching at the earliest feasible time (given proper notice) and complete work without delay.

B. Cutting:

1. Cut the work using methods that are least likely to damage work to be retained or adjoining work.

2. In general, use hand tools or small power tools designed for sawing or grinding, not hammering and chopping.

3. Cut through concrete and masonry using a cutting machine such as a

Carborundum saw or core drill to ensure a neat hole.

4. Cut holes and slots neatly to required size, with minimum disturbance of adjacent work.

5. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

6. Temporarily cover openings when not in use, taking to consideration life safety and fire regulations for occupied spaces.

7. Comply with other applicable requirements where cutting and patching requires excavating and backfilling.

8. If the area includes utility services enclosed in pipe or conduit that are scheduled to be removed as part of the undertaking, these should be disconnected and removed before cutting and patching as their later disturbance could damage the new patch.

    a. Be on the alert for undocumented and unprotected cabling for alarms, computer networks, and security systems that often follow the same path as conduit and piping. These are frequently found passing through enclosed spaces.

    b. Any cut-off conduit or pipe in walls or partitions is to be removed when possible.

    c. Any remaining openings need to be sealed to meet fire and building codes, and shall prevent the entrance of moisture or other foreign matter into the space.

C. Patching:

1. Patch with durable seams that are as inconspicuous as possible and that comply with specified tolerances for the work.

2. Where feasible, inspect and test patched areas to demonstrate integrity of work.

3. Restore exposed finishes of patched areas.

a. Where necessary, extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.

b. Where a patch occurs in a smooth painted surface, paint patched area with proper primer and base coat, and then extend the final paint coat over the entire unbroken surface which now contains the new patch.

4. Where removal of walls or partitions has newly extended one finished area into another, floor and wall surfaces in the new space shall be patched and repaired to provide an even surface of uniform color and appearance. If necessary, remove the existing floor and wall coverings and replace with new materials to achieve uniform color and appearance.

5. Patch, repair or re-hang existing ceilings as necessary to provide a surface with an even plane of uniform appearance.

3.04 **ADJUSTING/CLEANING**

Clean adjoining surfaces that become soiled due to the cutting and patching work.

END OF SECTION

SECTION 04- 2129-01

REMOVING GRAFFITI FROM HISTORICAL MASONRY AND TILE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This specification provides guidance for removing graffiti from historic masonry and tile materials.

1. This specification has been developed for use on historic properties (defined as any district, site, building, structure, or object that is listed in or eligible for listing in the National Register of Historic Places) and provides an overview of accepted practices. Site-specific specifications, when appropriate, will be provided by the Architect.
2. All work described herein and related work must conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.
3. The Contractor shall provide all labor, material, equipment, and operations required to complete the rehabilitation work indicated herein.
4. All work described herein and related work must have the approval of a Cultural Resources Manager, Conservator, Historic Architect, or other professional who meets the standards outlined in the Secretary of the Interior's Standards — Professional Qualifications Standards pursuant to 36 CFR.

1.02 SECTION INCLUDES

A. Cleaning of graffiti from masonry and tile surfaces

1.03 RELATED SECTIONS

A. Section 01100-07-S for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections and should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).:

1. Safety Precautions
2. Historic Structures Precautions
3. Submittals
4. Quality Assurance
5. Delivery, Storage and Handling
6. Project/Site Conditions
7. Sequencing and Scheduling
8. General Protection (Surface and Surrounding)

1.04 QUALITY ASSURANCE *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

A. The Contractor performing the work described in this Section shall have experience in masonry and tile cleaning and restoration and shall have successfully completed projects of similar scope.
He/she shall demonstrate a working knowledge of The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings.

1.05 SUBMITTALS

A. The Contractor shall submit to the Architect or GSA Approving Official:

1. A detailed schedule of the areas to be cleaned, including an assessment of the problem surfaces, and proposed graffiti removal procedures, application methods, dwell times, etc., for approval once cleaning test panels are completed and approved.
2. The manufacturer's product literature for all proprietary cleaning products. Product literature shall include specification data, Safety Data Sheets (SDS), and instructions for storage, handling, and use.
3. A project safety plan to include at minimum: any personal protective equipment to be used by the contractor staff such as disposable clothing, gloves and safety glasses, procedures for emergencies and accidents, documentation of staff training in use of equipment and/or chemical products as required by the manufacturers.

1.06 MOCK-UPS

A. The Contractor, at inconspicuous locations designated by the Project Team and RHPO, shall prepare test panels using the appropriate cleaning methods, to determine the best method to remove graffiti. The “best method” shall be defined as that which successfully removes the graffiti with no, or minimal, damage to the masonry and tile substrate.

B. Size of test panels shall be determined by the project Team and RHPO

C. The methods used, their application, etc. shall be in accordance with manufacturer's instructions and shall duplicate those procedures proposed for the overall graffiti removal process. The RHPO shall conduct a thorough evaluation of each method after graffiti removal is complete to determine the best method for the overall removal work.

D. The testing shall include an evaluation of the materials and techniques proposed for the protection of surrounding areas from the chemicals used to remove the graffiti, Evaluation must include an evaluation ofthe method to be used to collect the cleaning effluent.

E. For proprietary cleaning systems, a representative of the cleaning materials manufacturer(s) shall be present during the preparation and application of the test areas.

F. Approved test panels shall become part of the work and shall serve as the quality standard for all similar work.

1.07 DELIVERY, STORAGE, AND HANDLING (as applied to products and materials)

A. The Contractor shall:

1. Deliver restoration cleaning and testing materials and proprietary products to the project site in manufacturer's or distributor's packaging, undamaged, complete with application instructions and Safety Data Sheets (SDS)
2. Transport and store cleaning agents, chemicals, and solvents within the temperature range recommended by the manufacturer and away from direct sunlight. Handle all materials according to manufacturer's instructions.
3. Collect and dispose of waste material, packaging, debris, and effluent associated with the graffiti removal work in accordance with local, state, and federal environmental regulations.

1.08 SAFETY

A. The contractor shall only use chemical products whose safety data sheets (SDS) have been reviewed and considered acceptable by the Government. Any project surfaces containing lead-based paint, as disclosed by the Government, shall be handled by the contractor in accordance with OSHA (29 CFR 1926.62), EPA (40 CFR 261), and State regulations. Any lead-based paint or coating that is removed in a project resulting from this scope shall undergo Toxicity Characteristic Leaching Procedure (TCLP) testing by the contractor. The contractor shall dispose of any lead-paint waste as hazardous if it fails the TCLP.

B. Any paint or coating required to be removed which has not been disclosed by the Government to contain lead, shall be tested for lead by the contractor. All paints or coatings testing positive shall be handled and disposed of as lead-based.

C. The contractor shall isolate the work area with cones, tape or similar means as possible for the duration of the project, to prevent unauthorized individuals from entering the immediate work area.

D. For any work required on elevated surfaces (4 feet or more above the ground) the contractor shall install and use any ladders, scaffolding or platforms in accordance with OSHA regulations (29 CFR Subpart M).

1.09 PROJECT SITE CONDITIONS

A. The work of this Section shall be executed only when the air and surface temperatures are 40 degrees Fahrenheit and rising or less than 90 degrees F and falling. Minimum temperature for masonry cleaning shall be 50 degrees F and above for at least two hours after completion and above freezing for at least 24 hours after completion. Work shall not commence when rain, snow, or below-freezing temperatures are expected within the next24 hours. All surfaces shall be free of standing water, frost, and ice.

B. The Contractor is responsible for protecting existing adjacent areas and materials during the execution of the work and shall provide all necessary protection and follow all necessary work procedures to avoid damage to existing material assemblies and vegetation not a part of the work of this Section.

C. At a minimum, the Contractor shall:

1. Protect woodwork, glass, and metal adjacent to masonry areas to be cleaned from overspray and possible chemical or water damage from cleaning operations. Cover all window openings with waterproof plastic to prevent leakage to the building interior.

2. Protect surrounding vegetation from runoff during cleaning operations.
3. Exterior graffiti removal work areas should be accessed from the exterior only. Under no circumstances are hoses to be run or equipment transported through the building during exterior graffiti removal operations.
4. If necessary, the Contractor shall erect waterproof enclosures around areas where cleaning operations are in progress to protect nearby property and passers-by from overspray of cleaning chemicals or rinse water.

D. If applicable, the Contractor shall coordinate graffiti removal operations with the other trades involved in exterior and interior restoration work, including but not limited to masonry restoration, sealing, and painting. Masonry cleaning is to be completed prior to restoration of windows, doors, and metalwork, and prior to any exterior painting in the affected areas.

E. All Contractor personnel performing graffiti removal operations shall be provided by the Contractor with gloves, respirators, protective clothing and any other personal protective equipment (PPE) as recommended by the manufacturer of the masonry cleaning products and required by local, state, and federal regulations.

F. The Contractor shall complete installation of temporary sealants at window and door perimeters prior to starting cleaning operations where required to prevent leakage to the interior.

PART 2 - PRODUCTS

2.01 MASONRY AND TILE CLEANING OF GRAFFITI

A. Investigations and Method Selection:

1. Identification of materials types, surface and substrate conditions, previous treatments, and the materials used to create the graffiti for each area shall be determined. Testing may require additional technical expertise from a materials scientist, architectural conservator, microbiologist, and/or other technical expert. The Contractor shall choose the gentlest method possible to remove the graffiti without damaging the substrate material.
2. The Contractor shall conduct cleaning test patches in unobtrusive locations on the surface to be cleaned. The purpose of the
3. test patch is to determine the gentlest, most effective method to remove graffiti from the masonry and tile. Several cleaning methods are preferably tested side by side in small patches, size and location to be determined by RHPO and the project team.
4. Incised graffiti cannot be addressed by cleaning, and is therefore not covered under this section.
5. If graffiti is being removed during a larger masonry cleaning operation, staining and graffiti should be addressed after atmospheric soiling and biological growth are removed.
6. Graffiti is most easily removed when it has been freshly applied. Therefore, timely removal of graffiti is important.

B. Cleaning Methods:

1. Water and Detergent: Washing the surface with water at low to medium jet pressure, 500 psi or less at 3-6 gpm. Neutral or non-ionic detergents may be introduced. Note that most commercial pressure washing systems operate at significantly higher pressures than those recommended. Use of a pressure regulator to reduce pressures may be needed. Use the lowest possible pressure to achieve the desired results and check substrate for possible damage.

2. Poultices: A paste or slurry made with absorbent material or powder-inert clay, such as kaolin or sepiolite, diatomaceous earth (fuller's earth); or Cellulose products such as pulp cellulose, shredded paper that is mixed with a cleaning solution (a liquid reagent such as water, organic solvent, or paint stripper among others).

3. Organic Solvents and Paint Removers: Proprietary graffiti-removal products and/or commercial paint strippers containing organic solvents, sol gels, gel or paste removers, or paper or cloth-backed removers. Do not use “off-the-shelf” aerosol graffiti removers as these can cause additional staining and redistribution of pigments to clean areas.

C. Water/rinsing Method:

1. Surfaces shall be rinsed with clean water after cleaning is completed. Rinse water shall be collected and disposed of in accordance with federal state, and local environmental standards. Rates of water pressure shall be no greater than 400 psi at 3-6 gpm with minimal saturation for hard masonry or concrete and no higher than 100 psi for soft masonry.

D. Materials

1. Off-the-shelf chemical paint removers as tested and approved or approved equivalent product.

2. Clean, potable water to remove chemical residue.

3. Phenolphthalein or pH testing strips: Used to test pH of a surface after stripping paint with chemicals or any alkaline product.

4. Appropriate neutralizer as specified in graffiti remover product information.

E. Equipment for Application:

1. Pipes and hoses used for water cleaning shall be plastic or other similar material that is not subject to corrosion, which can cause discoloration and staining of surfaces being cleaned.

2. Natural bristle brushes shall be used for scrubbing. Metal brushes are not to be used.

3. Hoses, fittings, and equipment to be used for application of proprietary cleaning compounds shall be solvent, acid, or alkali resistant as recommended by the manufacturer of the cleaning products.

4. Buckets, trowels, and other tools to be used for mixing and application of poultices shall be solvent-resistant plastic. Wood scrapers and trowels are also permitted. No metal tools are to be used.

2.02 GRAFFITI REMOVAL

A. Apply the specified graffiti remover using a soft natural brush, roller or low pressure spray apparatus equipped with a nozzle 0.019 inch or larger. Spray equipment must be equipped with chemical resistant packing and hoses. Apply to a minimum thickness of 10 mils.

B. Allow the stripper to remain on the surface in accordance with the dwell time determined during preparation of the approved test panel. Dwell time will increase as temperatures decrease. Do not allow chemical to dry on substrate Following dwell time the Contractor shall remove lifted layers using a squeegee, plastic scraper, or wet vacuum device as required. Collect paint and stripper residue, and dispose of in accordance with local, state and federal regulations.

C. Thoroughly rinse surface with clean water. Reapply stripper as required to remove all existing layers of graffiti.

D. After graffiti has been removed, but before masonry dries, apply appropriate neutralizer, as specified in Product Data Sheet. A neutral Ph (7 pH) should be achieved.

   1. Allow neutralizer to stand on wall about three minutes before rinsing. Do not allow neutralizer to dry on substrate.
   2. Thoroughly rinse the surface with clean, clear water.
   3. Test the pH with litmus paper or phenolphthalein:
      a. Dissolve a 2” piece of phenolphthalein in denatured alcohol.
      b. Brush the solution onto the surface. If it turns a shade from pink to magenta there is still chemical residue.
   4. Continue to neutralize the surface and test until there is no color change in the phenolphthalein solution or the litmus paper registers as neutral.

2.03 FINAL REPORT

A. The Contractor shall:

   1. Provide a final report of completed work, including all approved submittals and photographs of the areas cleaned that were taken before, during, and after the work.
   2. Provide a written summary of the project and results upon final inspection and approval. The summary shall include a discussion of steps taken or new findings not specified in the initial documentation. Summary should also include any applicable ongoing care and warranty requirements.

END OF SECTION

SECTION 04- 2129-02

SEALING TERRA COTTA

PART 1 - GENERAL

1.1 SUMMARY

A. This procedure includes guidance on sealing terra cotta units which have lost their surface glaze.

B. See 01100-07-S for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:

1. Safety Precautions
2. Historic Structures Precautions
3. Submittals
4. Quality Assurance
5. Delivery, Storage and Handling
6. Project/Site Conditions
7. Sequencing and Scheduling
8. General Protection (Surface and Surrounding)

These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM),

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ProSoCo, Inc.

2.2 MATERIALS

A. Terra Cotta Sealing Materials: One-part, opaque, water base exterior masonry coating, containing silicone resin binders, that has excellent UV stability and allows at least90^0/amoisture vapor transmission based on ASTM E96, such as “BMC II Breathable Masonry Coating” (ProSoCo, Inc.), or approved equal. NOTE: Test all colors and receive approval from RHPO that color match is acceptable.

B. Water: Clean, free of oils, acids, alkalis and organic matter.

PART 3 - EXECUTION

3.1 PREPARATION

A. A. Protection:

1. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting from masonry restoration work.
2. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.
3. Protect sills, ledges, windows, and projections from sealing material droppings.

3.2 ERECTION, INSTALLATION, APPLICATION

A. Areas to be sealed: Areas to be sealed are only patches of the terra cotta units which have lost their surface glaze. Lightly brush spalled areas to remove loose material and glaze that has failed but not fallen from face of unit.

B. Clean terra cotta with sponge and clean water before sealing:

C. Prime areas to be sealed with specified primer using brush or roller application, strictly adhering to manufacturer's recommendations. Promptly remove all primer from surrounding surfaces. Test small areas of terra cotta and gain approval of manufacturer's representative and Contracting Officer before proceeding. Allow primer to dry 10 hours before applying masonry coating.

D. Apply breathable masonry paint in two coats, strictly adhering to manufacturer's recommendations. Brush apply first coat, wait 24 hours and brush apply second coat. Color shall match adjacent terra cotta units. Test small area of terra cotta and gain approval of manufacturer's representative and Contracting Officer before proceeding.

END OF SECTION

DIVISION 05

METALS

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer & fabricator.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Source quality-control reports.

E. Field quality-control and special inspection reports.

1.5 QUALITY ASSURANCE *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD or is City of Los Angeles Certified and

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE or has documented local experience in erection of structural steel for similar projects.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/Grade 50.

B. Channels, Angles: ASTM A 36.

C. Plate and Bar: ASTM A 36.

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M Grade C, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

   1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish

   1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

E. Headed Anchor Rods: ASTM F 1554, Grade 36.

F. Threaded Rods: ASTM A 36.

2.3 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 ".”Interior Painting.”

B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

C. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

2.6 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. PROVIDE TESTING AGENCY WITH ACCESS TO PLACES WHERE STRUCTURAL-STEEL WORK IS BEING FABRICATED OR produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furring
   2. Stud framing.
   3. Specialty framing.
   4. Connectors.
   5. Wall backings.
   6. Slot metal channel framing.
   7. Delegated design of framing.
   8. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 21 16 for gypsum shaft wall framing.
   2. Section 09 22 16 for lightgage metal framing.
   3. Section 09 22 26 for metal suspension systems.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AISI: American Iron and Steel Institute.
   2. AWS: American Welding Society.
   3. BMT: Base Metal Thickness.msg
   4. MSG: Manufacturer’s Standard Gage for Sheet Steel.
   5. HDG: Hot Dip Galvanized.

B. Definitions:
   1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.
   2. Metal Framing: Means cold-formed metal framing.

3. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified the Table below. Minimum thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project site.
4. Manufacturers' Standard Gage for Sheet Metal: Means the steel sheet thickness based on a weight of 41.82 pounds per square foot per inch of thickness.
5. Base Metal Minimum Thickness: Means the thickness of sheet steel material without any coatings.
6. Lightgage Metal Framing: Means metal framing members having a BMT of 30 mils BMT (MSG 20) or less and installed in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.
7. Cold-Formed Metal Framing: Means metal framing members having a BMT range of between 118 mils BMT (MSG 10) and 33 mils BMT (MSG 20) and installed in transverse or axial load-bearing applications, or in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.

Lightgage Metal Framing specified in Section 09 22 16		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Cold-Formed Metal Framing specified in this specification Section		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Engineer, fabricate, assemble, and install framing that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Exterior Wall Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".
2. Interior Partition Uniformly Distributed Lateral Live Load: At least 10 pounds per square foot.
3. Superstructure Displacement:
   a. Vertical Displacement of Adjacent Stories (Live Load Deflection): Allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.
   b. Horizontal Displacement of Adjacent Stories (Interstory Drift): Accommodate design displacement of adjacent stories indicated on the structural drawings and general notes.
4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.
5. Perpendicular Deflection (Convexity and Concavity): Framing members may not deflect more than shown in California Building Code Table 1604A.3 or the following, whichever is less, measured normal to the assembly plane. Limit asymmetric wall construction deflection to the most stringent requirement that applies to the assembly.
   a. Construction Supporting Masonry: Not more than L/600.
   b. Construction Supporting Stone: Not more than L/720.
   c. Construction Supporting Wall Panels: Not more than L/180.
   d. Construction Supporting Plaster: Not more than L/360.
   e. Construction Supporting Gypsum Board: Not more than L/240.
   f. Construction Supporting Tile: Not more than L/360.

6. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials. (changes)
7. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified in Section 05 50 10.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing framing conditions not detailed on the product data or indicated on the Drawings; or that are detailed, but not in a manner specific to the project.
      a. Show layouts, spacings, sizes, thickness, and types of metal framing, including reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, and accessories.
      b. Show fasteners brackets, clips, and attachments to other work, including seismic bracing and slab edge conditions. Label each attachment type by manufacturer's product name. Show base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
      c. Show head of wall connections for fire-resistance rated assemblies, framed opening details, acoustical seals and tie-in conditions to fireproofing, and inside and outside corner conditions.
B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished framing.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
    a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
    b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
    c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:
    1. Framing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
        a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
        b. Items provided for each different installation must be obtained from the same source and manufacturer.
    2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
B. Quality Standards:
    1. Design Standards:
        a. Comply with all requirements of the California Building Code (CBC).
        b. Comply with the requirements AISI publications S100, "*North American Specification for the Design of Cold-Formed Steel Structural Members"* and SG03 "*Cold-Formed Steel Design Manual"* for cold-formed steel framing design.

2. Material Standards:
   a. Comply with the requirements of AISI publication, "*Standard for Cold-Formed Steel Framing - General Provisions"*.
   b. Comply with the requirements of AISI publication, *"Standard for Cold-Formed Steel Framing - Header Design"*.
3. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
   a. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
   b. AWS D9.1, "*Sheet Metal Welding*".
   c. AWS D19.0, "*Welding Zinc Coated Steel*".

C. Qualifications:
1. Installer: Company or individuals must have experience installing framing for projects similar to this project in size, material, design, and complexity.
2. Welders: Welding personnel and supervisors must comply with, and welding procedures must conform to, the "*Qualification*" requirements of American Welding Society publications AWS D1.3, "*Structural Welding Code – Sheet Steel*" and AWS D19.0, "*Welding Zinc Coated Steel*" applicable to the project. Only certified welders current in their certification may perform or supervise any welding work.
3. Supervisors: Individuals must have experience installing framing for projects similar to this project in size, material, design, and complexity.

CI. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate framing into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective framing with undamaged new framing that does not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. California Expanded Metal Products Co. (CEMCO)
   2. Clarkwestern Dietrich Building Systems LLC.
   3. Olmar Supply Inc.
   4. SCAFCO Corp.

2.2 MATERIALS

A. HDG Metallic-Coated Steel Sheet for Cold-Formed Framing:
   ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COLD-FORMED FURRING

A. Hat Furring Channels:

1. Products: “FC Series Furring Channel” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
   a. Depth: 7/8- or 1-1/2-inch deep channels, as indicated.
   b. Minimum Thickness: At least 43 mils BMT (MSG 18).
   c. Web: 1-1/4 inches wide.
   d. Screw Flanges: 3/4-inch wide.

B. Z-shaped Furring Channels:

1. Products: “Z-Furring (ZF-Series)” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
   a. Depth: One to 3 inches deep, as indicated.
   b. Minimum Thickness: At least 43 mils BMT (MSG 18).
   c. Screw Flanges: 1-1/4 inches wide.

2.4 COLD-FORMED STUD FRAMING

A. Studs:

1. Description: Pre-punched roll-formed C-shaped framing members with manufacturer’s standard knockout sizing and spacing.
2. Product: “Structural Stud S162 (CSJ)” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal. (ICC ES Report No. ESR-1166P and Los Angeles Research Report No. RR 25889)
3. Requisite Properties:
   a. Depth: Indicated on the Drawings.
   b. Minimum Thickness: At least 54 mils BMT (MSG 16).
   c. Flanges: At least 1-5/8-inch (1-3/8- to 3) wide stiffened flanges with at least 1/2-inch returns (lip).

B. Tracks (Top and Bottom Runners):

1. Description: Un-punched roll-formed U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
2. Product: “Structural Track” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal. (ICC ES Report No. ESR-1166P and Los Angeles Research Report No. RR 25889)
3. Requisite Properties:
   a. Depth: Indicated on the Drawings.
   b. Minimum Thickness: At least 54 mils BMT. (MSG 16)
   c. Flanges: At least 1-1/2-inch wide unstiffened flanges.

C. Deflection Track Systems:
   1. Description: Slotted roll- or brake-formed track installed in head-of-wall deflection conditions to accommodate vertical movement caused by normal head-of-wall and floor extension or compression.
   2. Product: one of the following, or equal.
      a. “MaxTrack” slotted deflection track or “BlazeFrame” fire stop deflection track manufactured by Clarkwestern Dietrich Building Systems LLC. (Intertek Code Compliance Research Reports No. CCRR-0205)
      b. “CEMCO Slotted Track (CST)” manufactured by CEMCO.
D. Manufactured Bridging Channels:
   1. Description: Roll-formed channel- or L-shaped stiffeners with pre-notched slots installed in both load-bearing and non-load bearing walls to help resist stud twisting.
   2. Products: “Spazzer 5400” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
   3. Requisite Properties:
      a. Size: 1-1/2-inch wide by 1/2-inch deep.
      b. Minimum Thickness: At least 54 mils BMT (MSG 16).
   4. Bridging Clips: “Spazzer Bar Guard” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
   5. Alternative Bridging Clips: As an alternate to manufactured bridging clips, 1-1/2-inch wide by 1/2-inch deep by full stud width cold-rolled angle clips manufactured from at least 54-mil (MSG 16) BMT HDG metallic-coated steel sheet may be provided.
E. Cold Rolled Channel (CRC) Bridging:
   1. Description: Un-punched roll-formed U-shape stiffeners installed in both load-bearing and non-load bearing walls to help resist stud twisting.
   2. Requisite Properties:
      a. Size: 1-1/2-inch wide by 1/2-inch deep.
      b. Minimum Thickness: At least 54 mils BMT (MSG 16).
      c. Flanges: 1-1/2 inches wide unstiffened flanges.
   3. Manufactured Bridging Clips: “EasyClip U-, B-, or X-Series Clip Angles” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
F. Flat Strap Bridging (Strapping):
   1. Application: Flat sheet installed to provide resistance to stud rotation and minor axis buckling under loads for studs deeper than 6 inches.
   2. Requisite Properties:

a. Width: Between 2 and 20 inches, as indicated or necessary.
b. Minimum Thickness: At least 54 mils BMT (MSG 16).

G. Built-Up Headers:
1. Built-Up Curtain Wall Headers: Un-punched roll-formed C-shaped framing members and U-channel runners.
2. Load-Bearing Box Beam Headers: Un-punched roll-formed C-shaped framing members.
3. Requisite Properties:
a. Depth: Indicated on the Drawings.
b. Minimum Thickness: At least 54 mils BMT (MSG 16).
c. Flanges: 1-5/8-inch wide stiffened flanges with at least 1/2-inch returns (lip).
4. Header Connectors:
a. Description: Connectors to attach either beams to columns or headers to jambs.
b. Product: “DROP'N LOCK CLIP” connectors manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

2.5 SPECIALTY FRAMING

A. KCS Studs (King Kong Studs):
1. Description: Pre-punched C-shaped framing members with manufacturer’s standard knockout sizing and spacing.
2. Requisite Properties:
a. Depth: Indicated on the Drawings.
b. Minimum Thickness: At least 54 mils BMT (MSG 16).
c. Flanges: 3-inch wide stiffened flanges with at least 7/8-inch returns (lip).

B. Manufactured Headers:
1. Description: One- or 2-piece pre-engineered header with associated inserts and clips.
2. Products: one of the following, or equal.
a. “RedHeader RO Rough Opening System” manufactured by Clarkwestern Dietrich Building Systems LLC.
b. “Pro-X” manufactured by Brady Construction Innovations, Inc.

C. Corner Angles:
1. Description: Utility angles installed as a connection strut or angle, as corner reinforcement, or other various framing applications.
2. Requisite Properties:
a. Minimum Thickness: At least 30 mils BMT (MSG 20).

b. Legs: 2- or 3-inch wide legs, as indicated, unless a wider or uneven leg size is explicitly indicated; or is otherwise supplied, required, recommended, authorized, or accepted by the manufacturer.

2.6 CONNECTORS

A. Bypass Connectors:

1. Description: Clips used to attach exterior curtain wall studs to building superstructure and to provide vertical building movement independent of metal stud framing.
2. Bypass Slab Connectors: “Slide Clip” (minimal or no standoff conditions) or “Fast Clip Slide Clip” (medium standoff conditions) manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
3. Bypass Structure Connectors: “Quick Clip” (medium standoff conditions) and “Extended Fast Clip Slide Clip” or “Fast Strut” (large standoff conditions) manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

B. Multipurpose Connectors Rigid Connectors: “Uni-Clip” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

2.7 WALL BACKINGS

A. Metal Wall Backings:

1. Description: General multipurpose flat sheet and formed metal stock used as backing to support shelves, cabinets, fixtures or handrails when applied to framing. Provide wall backing in addition to, not as a replacement for, tension strapping or cross bracing.
2. Heavy-Duty Backing: Installed to support items distributing not more than 80 pounds per stud.
   a. Material: 6-inch wide un-punched U-shaped runners manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
   b. Provide individual runner in lengths long enough to span across at least 3 studs.
   c. Notch and bend track legs so that backing plate is flush with exterior face of stud.
   d. Do not cut track legs between supporting studs.
   e. Fasten backing track to each stud with at least 3 screw fasteners per stud.

3. Medium-Duty Backing: Installed to support items distributing not more than 20 pounds per stud.
    a. Material: Minimum 6-inch wide un-punched U-shaped runners manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
    b. Provide individual runner in lengths long enough to span across at least 2 studs.
    c. Fasten backing track to each stud with at least 3 screw fasteners per stud.
4. Light-Duty Backing: Installed to support items distributing not more than 5 pounds per stud.
    a. Backing Material: Minimum 6-inch wide backing strip manufactured from minimum 54-mil BMT (MSG 16) HDG metallic-coated steel sheet.
    b. Provide individual runner in lengths long enough to span across at lreast 3 studs.
    c. Fasten backing track to each stud with at least one screw fasteners per stud.

B. Wood Wall Backings:
1. Description: Fire-retardant treated wood (FRT) backing system.
2. Product: “Danback Flexible Wood Backing System” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
3. Requisite Properties:
    a. Material: Nominal 3/4-inch thick CDX Douglas fir fire-retardant treated wood
    b. Dimensions: 48 inches long by 5-1/8 inches high.

2.8 SLOT METAL CHANNEL FRAMING

A. Description: Continuous slot metal channel framing conforming to MFMA-4, and associated fittings and hardware necessary for supporting cable trays, conduit, pipes and similar items.

B. Material: At least 0.0747-inch BMT (MSG 14) HDG metallic-coated steel sheet complying with ASTM A 653, structural steel (SS), Grade 33 or better, at least a G90 zinc coating designation on both surfaces with equal coating weight on each surface.

C. Manufacturers: Provide products manufactured by one of the following, or equal.
1. Flex-Strut, Inc.
2. PHD Manufacturing, Inc.
3. Unistrut Corp.

D. Product: “P300 SL” manufactured by Unistrut Corp., or equal.

E. Requisite Properties:
   1. Types: standard and welded combination channels as required by conditions of installation and service.
   2. Height: heights as required by engineering calculations to meet load capacities, but not less than 1-3/8 inches.
   3. Suspension System: Hot-dip galvanized coarse-threaded (UNC) carbon steel rods having diameters as required by engineering calculations to meet load capacities, but not less than 3/8-inch.
F. Accessories: kickers, perimeter angle pieces and other accessories as supplied, required, recommended, or accepted by the slotted channel framing manufacturer and necessary for a complete and structurally-sound installation.
G. Finish: Chemically treated where retaining natural zinc finish; bonderized where painted finish is indicated.

2.9 ACCESSORIES

A. Sill Sealer and Liner Gaskets:
   1. Description: Self-adhering closed cell polyethylene foam air and moisture barrier.
   2. Applications:
      a. Sill Sealer: Install on the top of foundation wall, slab-on-grade. or curbs beneath exterior wall runner track or sill plates.
      b. Plate Liner: Install between floor deck and interior wall runner track or sill plates at shafts, hoistways, and other locations where necessary or indicated.
   3. Products: the following products manufactured by Protecto Wrap Co.
      a. Sill Sealer: 3/8-inch thick “Protecto Triple Guard Energy Sill Sealer”, or equal.
      b. Plate Liner: 1/4-inch thick “Protecto Energy Plate Liner”, or equal.
B. Shims: Load bearing, non-leaching, high-density multimonomer plastic.
C. Screw Fasteners: #8- and #10-32 UNC 2B (0.164- and 0.190-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-drilling uncoated bi-metal screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

D. Power-Actuated Fasteners:
   1. Description: ICC-ES-approved anchors conforming to California Building Code Occupancy Category III, Seismic Design Category E, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.
   2. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.
E. Fastenings: backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
F. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
   1. Install framing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Installed framing must be warrantable. Do not install, correct, or replace framing in a manner that results in any warranty or guarantee becoming void.

B. Metal Furring Special Techniques:
   1. Direct Furring: Attach to concrete or to masonry with stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
   2. Z-Furring:
      a. Except at outside corners, securely attach narrow flanges of furring members to walls with concrete stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
      b. At outside corners, attach wide flange of furring members to walls with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
C. Metal Framing Special Techniques:
   1. Align and securely attach floor and ceiling tracks to superstructure.
   2. Install studs in single lengths extending from floor to underside of floor or roof structure above without joints, except where indicated on the Drawings as stopping at or above ceilings. Stud splicing is prohibited without prior written authorization from the Architect.
      a. Install studs so that flanges within framing systems point in same direction.
      b. Continue framing around ducts that penetrate partitions above ceilings.
      c. Where framing extends to overhead structural supports, install vertical deflection connectors to produce joints at tops of framing assemblies that prevent axial loading of finished assemblies.
      d. Where studs stop at or above ceilings, brace not more than every fourth stud with opposite-side bracing installed at 45-degree angles and securely fastened to the underside of the floor or roof structure above.
      e. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
      f. Assemble corners using at least 3 studs.
   3. Unless otherwise indicated, provide screw attachment to tracks for
      a. studs with gypsum board on only one side;
      b. studs on each side of doors and windows;
      c. studs supporting wall hung plumbing fixtures; and
      d. studs supporting wall hung urinal screens, toilet compartments, cabinets, equipment, and similar items.

4. Attach all other studs to tracks either by friction fit for single stud gypsum board partitions or by attaching with screws in conformance with the manufacturer's published installation instructions.
    a. Space anchors within 6 inches of ends of each track segment ends, and not more than 24 inches on center.
    b. Do not install fasteners within 3 inches of slab or curb edges.
5. Where required by engineering calculations, install horizontal bridging spaced not more than 54 inches on center. Unless otherwise indicated, provide bridging in partitions supporting wall supported cabinets.
    a. Tack-weld stiffeners to each stud.
    b. Provide an additional 3/4 inch channel 6 inches above door headers, and extend at least 3 studs beyond the jamb studs.
    c. Install channels in longest possible lengths. At end joints, lap at least 12 inches and wire-tie. Do not tie together channels on opposite sides of staggered or double stud partitions.

D. Door and Window Opening Special Techniques:
1. Provide double studs (installed face to face to form a tube) at locations adjacent to doors and openings.
2. Extend studs at door openings to slab or deck above and securely anchor both to bottom track and to top slab or deck.
3. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
4. Install sections of track over door and window frames with clip angles securely attached at each end to adjacent vertical studs. Install cut-to-length studs at vertical joint locations; and at standard spacing over the door frame header extending to the ceiling track.
5. Install cripple studs at opening heads adjacent to each jamb stud, with at least a 1/2 inch clearance from the jamb stud to allow for installation of control joint in the finished assembly.

E. Other Opening Special Techniques: Unless otherwise indicated, frame other openings and recesses in stud walls the same as that required for door openings.
1. Install framing below sills matching framing required above door heads.
2. Provide additional framing as required for the secure attachment of electrical boxes, fire extinguisher cabinets, and similar items located in stud walls.

F. Backing Plate Special Techniques:
   1. Install supplementary framing and backing plates to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Wall-mounted and wall-hung items that require backing plates include the following.
      a. Ladders.
      b. Cabinets.
      c. Door stops.
      d. Toilet compartments and screens.
      e. Toilet accessories.
      f. Grab bars.
      g. Plumbing fixtures.
      h. Other items when indicated.
   2. Backing plates may be omitted if anchorage for wall-hung items is directly attached to at least 43-mil BMT (MSG 18) or heavier HDG metallic-coated cold-formed metal studs; or if the items are furnished with equivalent mounting devices.
G. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach framing to supporting construction.
H. Installation Tolerances: Install framing within the following tolerance variations.
   1. Maximum Out of Plumb: Not more than L/960 of span, or 1/8-inch in 10 feet.
   2. Maximum Out of Level: Not more than L/960 of span, or 1/8-inch in 10 feet,
   3. Maximum Out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
   4. Maximum Stud Spacing Variance: Not more than 1/8-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 05 5010
INTERIOR METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated non-decorative metal items.
   2. Shop-applied primer.
   3. Delegated design of metal fabrications.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AWS: American Welding Society.
   2. DFT: Dry Film Thickness.
   3. SSPC: The Society for Protective Coatings.

B. Definitions:
   1. Manufacturer: Means the grout or bituminous paint manufacturer, as the context admits, unless otherwise indicated.
   2. Fabricator: Means the metal fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:
   1. Engineer, fabricate, assemble, and install metal fabrications that conform to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
   2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:
   1. Design Loads: Indicated on the Drawings.
   2. Deflection: Not more than 1/8-inch.

3. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
4. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified below.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings:
      a. Submit dimensioned plans and elevations drawn to scale and showing metal fabrication layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
      b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
      c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
      d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
      e. Label each attachment type; indicate manufacturer's product name for each manufactured item.
      f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
      g. Label welds in conformance with the requirements of AWS publication A2.4, "*Standard Symbols for Welding, Brazing, and Nondestructive Examination*".
B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
    a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
    b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
    c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Quality Standard:
1. Design Standard for Galvanized Items: Items indicated as galvanized must be designed and fabricated in conformance with the requirements of AGA publication, "*The Design of Products to be Hot-Dip Galvanized after Fabrication"*, and ASTM A 385. Limit the use of vent and drain holes and locate where they drain by gravity and are concealed from view in the finish work.
2. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
    a. AWS D1.1, "*Structural Welding Code – Steel*".
    b. AWS D1.2, "*Structural Welding Code – Aluminum*".
    c. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
    d. AWS D1.6, "*Structural Welding Code – Stainless Steel*".
    e. AWS D1.8, "*Seismic Supplement*".
    f. AWS D9.1, "*Sheet Metal Welding*".
    g. AWS D10.10, "*Heating Practices For Pipe And Tube*".
    h. AWS D10.11, "*Root Pass Welding For Pipe*".
    i. AWS D10.12, "*Pipe Welding – Mild Steel*".
    j. AWS D10.18, "*Pipe Welding – Stainless Steel*".
    k. AWS D11.2, "*Welding – Cast Iron*".
    l. AWS D18.2, "*Stainless Steel Tube Discoloration Guide*".
    m. AWS D19.0, "*Welding Zinc Coated Steel*".

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Fabricator: Company or individuals must have experience with metal fabrications on projects similar to this project in size, material, design, and complexity
2. Installer: Company or individuals must have experience installing metal fabrications for previous projects similar to this project in size, material, design, and complexity.
3. Welders: Welding personnel and supervisors must comply with the "*Qualification*" requirements of AWS quality standard publications. Only certified welders current in their certification may perform or supervise any welding work.
4. Supervisors: Individuals must have experience installing metal fabrications for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading metal fabrication installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective metal fabrications with undamaged new metal fabrications that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 IRON

A. Ductile Iron Castings: ASTM A 536, Grade 70-50-05 or better.

2.2 STEEL

A. Steel Plate: ASTM A 36 (mild steel).

B. Uncoated Steel Coil, Sheet, and Strip: Finished cold-rolled steel coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), unexposed (interior items) and exposed, temper rolled (exterior items), regular matte finish (40 to 59 AA), mill phosphatized.

C. HDG Metallic Coated Steel Coil, Sheet, and Strip: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface, coating designation indicated below on both surfaces, minimized spangle, chemically treated, oiled, and mill phosphatized.

1. Natural Finish: At least a G90 minimum coating designation (galvanized), minimized spangle, chemically treated, and oiled.
2. Painted Finish: At least an A60 minimum coating designation (galvannealed), not chemically treated, not oiled, and mill phosphatized.

D. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.

E. Steel Pipe: ASTM A 53, black pipe, Type and Grade as indicated below, size and weight class, schedule number, or outside diameter indicated and wall thickness as required by engineering calculations for type of use indicated.

1. Type: Provide Type S (Seamless) pipe.
2. Grade: Provide Grade A pipe for cold bending; otherwise provide Grade B pipe.

F. Steel Tubing:

1. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness as required by engineering calculations for type of use indicated. Provide seamless tubing.
2. Mechanical Tubing: ASTM A 513, black, Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).

G. Steel Castings: ASTM A 27, Grade 65-35, Class 2 (post-weld heat-treatment not required).

H. Galvanized Carbon Steel Wire: Soft temper zinc-coated wire conforming to ASTM A 641, minimum Class 4 coating weight.

2.3 STAINLESS STEEL

A. Stainless Steel Bars, Hot-Rolled or Extruded Shapes: ASTM A 276, Condition T (hardened and tempered at a relatively high temperature), Type 304L (for welded applications) or Type 304 (for all other applications), passivated in conformance with ASTM A 967.

B. Stainless Steel Pipe: ASTM A 312, Grade TP (pipe), Type 304L (for welded applications) or Type 304 (for all other applications), passivated in conformance with ASTM A 967.

C. Stainless Steel Coil, Sheet, Strip, Plate, and Flat Bar:

1. Exposed Locations: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), passivated in conformance with ASTM A 967.
   a. Uncoated (Bare) or Natural Finish: No. 2B (bright) finish.
   b. Painted Finish: No. 2D (matte) finish.
2. Concealed Locations: ASTM A 240 (annealed) Type 304L (for welded applications) or Type 304 (for all other applications), No. 2D (matte) finish, annealed, No. 4 (soft) temper (hardness not more than Rockwell B-65; can be bent flat upon itself in any direction), passivated in conformance with ASTM A 967.

D. Stainless Steel Tubing: ASTM A 554, Grade MT (tubing), Type 304L (for welded applications) or Type 304 (for all other applications), No. 2D (matte) finish, passivated in conformance with ASTM A 967.

E. Stainless Steel Castings: ASTM A 743, Grade CF8M or CF3M.

2.4 ALUMINUM

A. General: Unless otherwise indicated, provide aluminum alloy and temper recommended by both the metal producer for the type of use, strength, and welding characteristics; and by the aluminum finisher for color match and compatibility of fabricated items with specified finish.

B. Cold-Rolled Aluminum Bar and Rod: ASTM B 211.

C. Extruded Bars, Shapes and Tubes:

1. Standard Structural Profiles: ASTM B 308, Alloy 6061-T6.
2. Extruded Aluminum Bars and Shapes: ASTM B 221.
   a. Alloy and Temper: 6063-T5 or T6 for primary components; 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for structural components.
   b. Minimum Thickness: At least 0.125-inch.

D. Sheet and Plate: ASTM B 209.

1. Alloy and Temper: 5005-H32 (for anodic finishing), or alloy 3003-H14 (for painted or unfinished sheet).
2. Minimum Thickness: At least 0.060-inch.

E. Aluminum Pipe:

1. Structural Aluminum Pipe and Round Tube: ASTM B 429.
2. Seamless Aluminum Pipe and Seamless Extruded Tubes: ASTM B 241.

F. Aluminum Tubing:

1. Seamless Drawn Aluminum Tubes: ASTM B 210.
2. Extruded Aluminum Tubes: ASTM B 221 or ASTM B 483.

G. Aluminum Die and Hand Forgings: ASTM B 247.

H. Aluminum Castings: ASTM B 26.

2.5 ACCESSORIES

A. Flanges and Anchors: Unless otherwise indicated, provide cast or formed metal of the same type, material, and finish as the supported metal fabrications.

B. Grout:

1. Description: Pre-packaged, non-shrink, non-metallic, non-corrosive, non-staining, non-gaseous grout conforming to ASTM C 1107, Grade A (drypack) and Grades B and C (flowable grout) of a consistency suitable for application within a 30-minute working time.

2. Type: Grout specifically recommended by the manufacturer for interior and exterior applications.
3. Minimum 28-day Compressive Strength: At least 7,500 pounds per square inch.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 SHOP APPLIED STEEL PRIMER

A. Surface Preparation: Prepare surfaces in conformance with manufacturer-prepared published and supplemental instructions, and SSPC surface preparation standard SSPC-SP3, "*Power Tool Cleaning*".

B. Acrylic Primer:

1. Description: Hydrophobic acrylic dry-fall high performance coating primer
2. Application: Applied to interior exposed-in-service steel surfaces.
3. Product: "Uni-Bond DF Series 115" manufactured by the Tnemec Co., or equal.
4. Requisite Properties:
   a. Minimum Thickness: Between 2.0 and 3.5 mils DFT per coat, when measured in conformance with SSPC paint application standard SSPC-PA2, "*Measurement of Dry Coating Thickness with Magnetic Gages*".
   b. Color: Match Tnemec color 10-1009, "Gray".
5. Performance Requirements:
   a. Minimum Dry Film Adhesion: At least a 5B rating, when tested in conformance with ASTM D 3359.
   b. Minimum Humidity Resistance: No blistering, cracking, rusting, or delaminating of film after at least 500 hours exposure, when tested in conformance with ASTM D 4585.
   c. Minimum Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film and no rust creep at scribe after at least 500 hours exposure, when tested in conformance with ASTM B 117.
   d. Minimum Slip Coefficient Rating: At least 0.50 (AISC Class B surface), when tested in conformance with ASTM A 490.

2.7 FABRICATION

A. Shop Fabrication:

1. Fabricate items in largest sections practicable to minimize field jointing.

2. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
3. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.
4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.
5. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.
6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
7. Cut, reinforce, drill, punch, thread, and tap metal fabrications as necessary to receive other fabrications, components, accessories, hardware, and similar items, and as required to securely attach to supporting construction
8. Before cleaning, treating, and applying specified finishes, remove blemishes by grinding.
9. Remove sharp or rough areas on exposed traffic surfaces. Ease exposed edges to a nominal 1/32-inch radius.

B. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.
1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that at welded joints, offsets are prohibited.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

C. Shop Priming: :
1. Install primer using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install primers under conditions that ensure finishes are free from blemishes and defects.

3. To avoid surface contaminant pick-up, promptly prime prepared surfaces as soon as practicable after and within the same day as surface preparation.
4. Verify primer film thickness during application by taking numerous measurements.
5. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Primer surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
6. Do not exceed the application rates recommended by the manufacturer.
7. Installed primers must be warrantable. Do not install, correct, or replace primers in a manner that results in any warranty or guarantee becoming void.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for metal fabrication installation.
2. Set metal fabrications true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.

4. Dry-pack metal fabrications supported on concrete and masonry to provide firm, level bearing surfaces.
5. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.
6. Fit exposed connections accurately to form flush hairline joints

B. Interface with Adjacent Items:
1. Attachment: Provide materials, components, and accessories normally furnished or necessary to securely attach metal fabrications to supporting construction.
2. Field Welding:
a. Comply with AWS quality standard publications for manual shielded arc welding procedures, appearance and quality of welds, and methods to correct faulty welds.
b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
c. Before welding, grind to remove zinc coating from one to 4 inches from either side of the intended weld zone and on both sides of the item.
d. Obtain fusion without undercut or overlap.
e. Promptly remove welding flux.
f. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
g. Do not weld, cut, or abrade exterior surfaces hot-dip galvanized after fabrication and are for bolted or screwed field connections.
h. Field-weld connections indicated as exposed joints but cannot be shop-welded because of shipping size limitations.
i. Welds remaining exposed must be ground smooth and flush to match and blend with parent metal surfaces.
j. Clean field welds, weld spatter, bolted connections, and abraded areas promptly after installation.

C. Installation Tolerances: Install metal fabrications to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.
D. Damaged Primer Touchup: Clean and prepare damaged primed surfaces in conformance with manufacturer's published instructions and SSPC surface preparation standard SSPC-SP11 "*Power Tool Cleaning to Bare Metal*".
   1. Sand smooth and re-clean.
   2. Spot-prime bare metal surfaces with specified primer applied to a total spot primer DFT of at least 5 mils.
   3. Overlap undamaged primer areas with spot primer at least 2 inches.
E. Damaged Galvanizing Touchup: Repair damaged galvanized items or re-galvanize items that cannot be satisfactorily repaired to the Architect's acceptance.
   1. Zinc-Based Solder Repair: Repair damaged galvanizing in conformance with ASTM A 780 Annex A1.
   2. Organic Zinc-Rich Cold Galvanizing Compound Repair:
      a. Repair damaged galvanizing in conformance with ASTM A 780 Annex A2
      b. Apply cold galvanizing repair compound to a DFT of 1.5 plus or minus 0.5 mils per coat, when measured in conformance with SSPC publication SSPC-PA 2, "*Determining Compliance to Required DFT*". Provide 2 coats.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated non-decorative metal pipe and tube railings.
   2. Delegated design of railing assemblies.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 50 10 for dissimilar metal corrosion protection.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AWS: American Welding Society.
   2. DFT: Dry Film Thickness.
   3. HDG: Hot-Dip Galvanized.
   4. SSPC: The Society for Protective Coatings.

B. Definitions:
   1. Manufacturer: Means the accessory manufacturer, unless otherwise indicated.
   2. Fabricator: Means the metal fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:
   1. Engineer, fabricate, assemble, and install metal railings that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
   2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Railing, Handrail, and Infill Loads: Assume uniform and concentrated railing loads are not applied concurrently, and infill horizontal load are not applied concurrently with other loads.
   a. Minimum Uniform Load: At least 50 pounds per foot applied horizontally and vertically downward to the top rail.
   b. Minimum Concentrated Load: At least 200 pounds applied vertically downward and horizontally at any point along the top rail.
   c. Minimum Infill load: At least a 50-pound load horizontal load distributed over a one square foot area at any location.
2. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
3. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing metal railing layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
   c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
   d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
   e. Label each attachment type; indicate manufacturer's product name for each manufactured item.

f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.

g. Label welds in conformance with the requirements of AWS publication A2.4, "*Standard Symbols for Welding, Brazing, and Nondestructive Examination*".

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.

a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.

b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.

c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Railings and Handrails must conform to the requirements of California Building Code Section 11B-505.

2. Top of gripping surfaces of handrails must be 34 inches minimum and 38 inches maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails must be at a consistent height above such surfaces.

3. Clearance between handrail gripping surfaces and adjacent surfaces must be 1-1/2 inches minimum. Handrail may be located in a recess if the recess is 3 inches maximum deep and 18 inches minimum clear above the top of the handrail.

4. Handrail gripping surfaces must be continuous along their length and must not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces must not be obstructed for more than 20 percent of their length. Where provided, horizontal projections must occur 1-1/2-inch minimum below the bottom of the handrail gripping surfaces.
5. Handrail gripping surfaces with a circular cross section must have an outside diameter of 1-1/4-inches minimum and 2 inches maximum.
6. Handrail gripping surfaces with a non-circular cross section must have an outside dimension of 4 inches minimum and 6-1/4 inches maximum, and a cross-sectional dimension of 2-1/4 inches maximum.
7. Handrail gripping surfaces and any surfaces adjacent to them must be free of sharp or abrasive elements and must have rounded edges.
8. Handrails must not rotate within their fittings.
9. Handrail gripping surfaces must extend beyond and in the same direction of stair flights and ramp runs in accordance with California Building Code Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
10. A 2-inch minimum high curb or barrier must be provided to prevent the passage of a 4 inches diameter sphere rolling off the edges on a ramp or landing surface. Such a curb or barrier must be continuous and uninterrupted along the length of a ramp. California Building Code Section 11B-405.9.2

B. Quality Standards:

1. Design Standard for Galvanized Items: Items indicated as galvanized must be designed and fabricated in conformance with the requirements of AGA publication, "*The Design of Products to be Hot-Dip Galvanized after Fabrication"*, and ASTM A 385. Limit the use of vent and drain holes and locate where they drain by gravity and are concealed from view in the finish work.
2. Railing Assembly Standard: Provide railings conforming to the requirements of NAAMM Standard AMP 510, "*Metal Railings Manual*".
3. Railing Assembly Standard: Provide railings conforming to the requirements of ANSI/NAAMM Standard AMP 521, "*Pipe Railing Systems Manual"*.
4. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
   a. AWS D1.1, "*Structural Welding Code – Steel*".
   b. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
   c. AWS D19.0, "*Welding Zinc Coated Steel*".

C. Qualifications:

1. Fabricator: Company or individuals must have experience on a project similar in size, material, design, and complexity
2. Installer: Must have experience installing metal railings for previous projects similar to this project in size, material, design, and complexity.
3. Welders: Welding personnel and supervisors must comply with the "*Qualification*" requirements of AWS quality standard publications. Only certified welders current in their certification may perform or supervise any welding work.
4. Supervisors: Individuals must have experience on previous projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective railing components with undamaged new railing components that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 METAL RAILINGS

A. Posts and Rails: Indicated on the Drawings.

B. Infill: Indicated on the Drawings.

C. Handrails: Fabricate from at least 0.1196-inch BMT (MSG 11) steel mechanical tubing.

D. Guardrail Brackets: Indicated on the Drawings.

E. Wall Handrail Brackets: “1701-2” cast ductile iron wall mount handrail bracket, Style U, with a projection of 2-1/2 inches from wall to center of handrail, and one 3/8-16 tapped mounting hole for use with flat or round handrail, unfinished; manufactured by R&B Wagner, Inc., or equal. Provide “B1416” anchor plate or “1722” wall mount filler for 5/8-inch drywall where required to prevent crushing finish material.

2.2 MATERIALS

A. Ductile Iron Castings: ASTM A 536, Grade 70-50-05 or better.

B. Steel Pipe: ASTM A 53, black pipe, Type and Grade as indicated below, size and weight class, schedule number, or outside diameter indicated and wall thickness as required by engineering calculations for type of use indicated.

1. Type: Provide Type S (Seamless) pipe.
2. Grade: Provide Grade A pipe for cold bending; otherwise provide Grade B pipe.

C. Steel Tubing:

1. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness as required by engineering calculations for type of use indicated. Provide seamless tubing.
2. Mechanical Tubing: ASTM A 513, black, Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).

2.3 ACCESSORIES

A. Flanges and Anchors: Unless otherwise indicated, provide cast or formed metal of the same type, material, and finish as the supported metal fabrications.

B. Grout:

1. Description: Pre-packaged, non-shrink, non-metallic, non-corrosive, non-staining, non-gaseous grout conforming to ASTM C 1107, Grade A (drypack) and Grades B and C (flowable grout) of a consistency suitable for application within a 30-minute working time.
2. Type: Grout specifically recommended by the manufacturer for interior and exterior applications.
3. Minimum 28-day Compressive Strength: At least 7,500 pounds per square inch.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 FABRICATION

A. Shop Fabrication:

1. Fabricate items in largest sections practicable to minimize field jointing.
2. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
3. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.
4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.
5. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.

6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
7. Cut, reinforce, drill, punch, thread, and tap metal railings as necessary to receive other fabrications, components, accessories, hardware, and similar items, and as required to securely attach to supporting construction
8. Before cleaning, treating, and applying specified finishes, remove blemishes by grinding.
9. Remove sharp or rough areas on exposed traffic surfaces. Ease exposed edges to a nominal 1/32-inch radius.

B. Welded Joint Finish Appearance: NOMMA Finish #2. (completely sanded joint, some undercutting and pinholes okay)

C. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.
1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that at welded joints, offset are prohibited.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.

C. Evaluation and Assessment:
1. Identify project conditions that do not conform to the fabricator’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Dissimilar Metal Corrosion Protection: Prevent galvanic action by permanently isolating metal surfaces from direct contact with more noble or cationic metals, incompatible materials, and other potentially corrosive surfaces in conformance with Section 05 50 10.

3.3 INSTALLATION

A. General Requirements:
   1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for metal railing installation.
   2. Set metal railings true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
   3. Shim as required with concealed shims.
   4. Dry-pack metal railings supported on concrete and masonry to provide firm, level bearing surfaces.
   5. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.
   6. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:
   1. Adjust railing systems before anchoring to ensure matching alignment at abutting joints.
   2. Space posts at spacing indicated or, if not indicated, as required by design loads.
   3. Plumb posts in each direction.
   4. Secure posts and rail ends to building construction by welding directly to steel supporting members.
   5. Attach handrails to wall with brackets. Provide 1-1/2-inch clearance from inside face of handrail to finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction.
   6. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

C. Interface with Adjacent Items:
   1. Attachment: Provide materials, components, and accessories normally furnished or necessary to securely attach metal railings to supporting construction.

2. Field Welding:
    a. Comply with AWS quality standard publications for manual shielded arc welding procedures, appearance and quality of welds, and methods to correct faulty welds.
    b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    c. Before welding, grind to remove zinc coating from one to 4 inches from either side of the intended weld zone and on both sides of the item.
    d. Obtain fusion without undercut or overlap.
    e. Promptly remove welding flux.
    f. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
    g. Do not weld, cut, or abrade exterior surfaces hot-dip galvanized after fabrication and are for bolted or screwed field connections.
    h. Field-weld connections indicated as exposed joints but cannot be shop-welded because of shipping size limitations.
    i. Welds remaining exposed must be ground smooth and flush to match and blend with parent metal surfaces.
    j. Clean field welds, weld spatter, bolted connections, and abraded areas promptly after installation.

D. Installation Tolerances: Install metal railings to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
    1. written descriptions of non-conforming, damaged, and defective work;
    2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
    3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

D. Damaged Primer Touchup: Clean and prepare damaged primed surfaces in conformance with manufacturer's published instructions and SSPC surface preparation standard SSPC-SP11 "*Power Tool Cleaning to Bare Metal*".

1. Sand smooth and re-clean.
2. Spot-prime bare metal surfaces with specified primer applied to a total spot primer DFT of at least 5 mils.
3. Overlap undamaged primer areas with spot primer at least 2 inches.

E. Damaged Galvanizing Touchup: Repair damaged galvanized items or re-galvanize items that cannot be satisfactorily repaired to the Architect's acceptance.

1. Zinc-Based Solder Repair: Repair damaged galvanizing in conformance with ASTM A 780 Annex A1.
2. Organic Zinc-Rich Cold Galvanizing Compound Repair:
   a. Repair damaged galvanizing in conformance with ASTM A 780 Annex A2
   b. Apply cold galvanizing repair compound to a DFT of 1.5 plus or minus 0.5 mils per coat, when measured in conformance with SSPC publication SSPC-PA 2, "*Determining Compliance to Required DFT*". Provide 2 coats.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed railings in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed railings unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed railings as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 05 7300
DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated decorative metal railings.
   2. Delegated design of railing assemblies.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 50 10 for dissimilar metal corrosion protection.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AWS: American Welding Society.
   2. DFT: Dry Film Thickness.
   3. HDG: Hot-Dip Galvanized.
   4. SSPC: The Society for Protective Coatings.

B. Definitions:
   1. Fabricator: Means the metal fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:
   1. Engineer, fabricate, assemble, and install metal railings that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
   2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Railing, Handrail, and Infill Loads: Assume uniform and concentrated railing loads are not applied concurrently, and infill horizontal load are not applied concurrently with other loads.
   a. Minimum Uniform Load: At least 50 pounds per foot applied horizontally and vertically downward to the top rail.
   b. Minimum Concentrated Load: At least 200 pounds applied vertically downward and horizontally at any point along the top rail.
   c. Minimum Infill load: At least a 50-pound load horizontal load distributed over a one square foot area at any location.
2. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
3. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing metal railing layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
   c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
   d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
   e. Label each attachment type; indicate manufacturer's product name for each manufactured item.

f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.

g. Label welds in conformance with the requirements of AWS publication A2.4, "*Standard Symbols for Welding, Brazing, and Nondestructive Examination*".

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.

a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.

b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.

c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Railings and Handrails must conform to the requirements of California Building Code Section 11B-505.

2. Top of gripping surfaces of handrails must be 34 inches minimum and 38 inches maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails must be at a consistent height above such surfaces.

3. Clearance between handrail gripping surfaces and adjacent surfaces must be 1-1/2 inches minimum. Handrail may be located in a recess if the recess is 3 inches maximum deep and 18 inches minimum clear above the top of the handrail.

4. Handrail gripping surfaces must be continuous along their length and must not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces must not be obstructed for more than 20 percent of their length. Where provided, horizontal projections must occur 1-1/2-inch minimum below the bottom of the handrail gripping surfaces.
5. Handrail gripping surfaces with a circular cross section must have an outside diameter of 1-1/4-inches minimum and 2 inches maximum.
6. Handrail gripping surfaces with a non-circular cross section must have an outside dimension of 4 inches minimum and 6-1/4 inches maximum, and a cross-sectional dimension of 2-1/4 inches maximum.
7. Handrail gripping surfaces and any surfaces adjacent to them must be free of sharp or abrasive elements and must have rounded edges.
8. Handrails must not rotate within their fittings.
9. Handrail gripping surfaces must extend beyond and in the same direction of stair flights and ramp runs in accordance with California Building Code Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
10. A 2-inch minimum high curb or barrier must be provided to prevent the passage of a 4 inches diameter sphere rolling off the edges on a ramp or landing surface. Such a curb or barrier must be continuous and uninterrupted along the length of a ramp. California Building Code Section 11B-405.9.2

B. Quality Standard:
1. Design Standard for Galvanized Items: Items indicated as galvanized must be designed and fabricated in conformance with the requirements of AGA publication, "*The Design of Products to be Hot-Dip Galvanized after Fabrication"*, and ASTM A 385. Limit the use of vent and drain holes and locate where they drain by gravity and are concealed from view in the finish work.
2. Railing Assembly Standard: Provide railings conforming to the requirements of NAAMM Standard AMP 510, "*Metal Railings Manual*".
3. Railing Assembly Standard: Provide railings conforming to the requirements of ANSI/NAAMM Standard AMP 521, "*Pipe Railing Systems Manual"*.
4. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
   a. AWS D1.1, "*Structural Welding Code – Steel*".
   b. AWS D1.2, "*Structural Welding Code – Aluminum*".
   c. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
   d. AWS D1.6, "*Structural Welding Code – Stainless Steel*".

e. AWS D1.8, "*Seismic Supplement*".
f. AWS D9.1, "*Sheet Metal Welding*".
g. AWS D10.10, "*Heating Practices For Pipe And Tube*".
h. AWS D10.11, "*Root Pass Welding For Pipe*".
i. AWS D10.12, "*Pipe Welding – Mild Steel*".
j. AWS D10.18, "*Pipe Welding – Stainless Steel*".
k. AWS D18.2, "*Stainless Steel Tube Discoloration Guide*".

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Fabricator: Company or individuals must have experience fabricating metal railings installed on previous projects similar to this project in size, material, design, and complexity
2. Installer: Company or individuals must have experience installing metal railings for previous projects similar to this project in size, material, design, and complexity.
3. Welders: Welding personnel and supervisors must comply with the "*Qualification*" requirements of AWS quality standard publications. Only certified welders current in their certification may perform or supervise any welding work.
4. Supervisors: Individuals must have experience installing metal railings for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading metal railing installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.

2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective railing components with undamaged new railing components that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 METAL RAILINGS

A. Posts and Rails: Indicated on the Drawings.

B. Infill: Indicated on the Drawings.

C. Handrails: Fabricate from at least 0.1196-inch BMT (MSG 11) steel mechanical tubing.

D. Guardrail Brackets: Indicated on the Drawings.

E. Wall Handrail Brackets: “1701-2” cast ductile iron wall mount handrail bracket, Style U, with a projection of 2-1/2 inches from wall to center of handrail, and one 3/8-16 tapped mounting hole for use with flat or round handrail, unfinished; manufactured by R&B Wagner, Inc., or equal. Provide “B1416” anchor plate; or “1722” wall mount filler for 5/8-inch drywall where required to prevent crushing finish material.

2.2 MATERIALS

A. Steel:

1. Steel Plate: ASTM A 36 (mild steel).
2. Uncoated Steel Coil, Sheet, and Strip: Finished cold-rolled steel coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), unexposed (interior items) and exposed, temper rolled (exterior items), regular matte finish (40 to 59 AA), mill phosphatized.

3. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.
4. Steel Pipe: ASTM A 53, black pipe, Type and Grade as indicated below, size and weight class, schedule number, or outside diameter indicated and wall thickness required by engineering calculations for type of use indicated.
    a. Appearance: Type S (seamless).
    b. Bending: Provide Grade A pipe when cold bending is required; otherwise provide Grade B pipe.
5. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness required by engineering calculations for type of use indicated. Provide seamless tubing.
6. Mechanical Tubing: ASTM A 513, black, Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).

B. Stainless Steel:
1. Stainless Steel Bars, Hot-Rolled or Extruded Shapes: ASTM A 276, Condition T (hardened and tempered at a relatively high temperature), Type 304L (for welded applications) or Type 304 (for all other applications) No. 4 (directional) finish, passivated in conformance with ASTM A 967.
2. Stainless Steel Pipe: ASTM A 312, Grade TP (pipe), Type 304L (for welded applications) or Type 304 (for all other applications) No. 4 (directional) finish, passivated in conformance with ASTM A 967.
3. Stainless Steel Plate and Flat Bar:
    a. Exposed Locations: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications) No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.
    b. Concealed Locations: ASTM A 240 (annealed) Type 304L (for welded applications) or Type 304 (for all other applications), No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.
4. Stainless Steel Tubing: ASTM A 554, Grade MT (tubing), Type 304L (for welded applications) or Type 304 (for all other applications), No. 4 (directional) finish, passivated in conformance with ASTM A 967.

C. Aluminum:
1. Standard Structural Profiles (Alloy 6061-T6): ASTM B 308.

2. Extruded Bars, Shapes and Tubes:
    a. Standard Structural Profiles (Alloy 6061-T6): ASTM B 308.
    b. Extruded Aluminum Bars and Shapes: ASTM B 221.
        1) Alloy and Temper: 6063-T5 or T6 for primary components; 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for structural components.
        2) Minimum Thickness: At least 0.125-inch.
3. Aluminum Tubing:
    a. Seamless Drawn Aluminum Tubes: ASTM B 210.
    b. Extruded Aluminum Tubes: ASTM B 221 or ASTM B 483.

2.3 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Flanges and Anchors: Unless otherwise indicated, provide cast or formed metal of the same type, material, and finish as the supported metal fabrications.

C. Grout:
    1. Description: Pre-packaged, non-shrink, non-metallic, non-corrosive, non-staining, non-gaseous grout conforming to ASTM C 1107, Grade A (drypack) and Grades B and C (flowable grout) of a consistency suitable for application within a 30-minute working time.
    2. Type: Grout specifically recommended by the manufacturer for interior and exterior applications.
    3. Minimum 28-day Compressive Strength: At least 7,500 pounds per square inch.

D. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 FABRICATION

A. Shop Fabrication:
    1. Fabricate items in largest sections practicable to minimize field jointing.
    2. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
    3. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.

4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.
5. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.
6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
7. Cut, reinforce, drill, punch, thread, and tap metal railings as necessary to receive other fabrications, components, accessories, hardware, and similar items, and as required to securely attach to supporting construction
8. Before cleaning, treating, and applying specified finishes, remove blemishes by grinding.
9. Remove sharp or rough areas on exposed surfaces. Ease exposed edges to a nominal 1/32-inch radius.

B. Welded Joint Finish Appearance: NOMMA Finish #1. (no evidence of a welded joint)

C. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.
1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that at welded joints, offset are prohibited.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

2.5 FINISHES

A. Stainless Steel: No. 4 (directional) finish, passivated in conformance with ASTM A 967.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Dissimilar Metal Corrosion Protection: Prevent galvanic action by permanently isolating metal surfaces from direct contact with more noble or cationic metals, incompatible materials, and other potentially corrosive surfaces in conformance with Section 05 50 10.

3.3 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for metal railing installation.
2. Set metal railings true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Dry-pack metal railings supported on concrete and masonry to provide firm, level bearing surfaces.
5. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.
6. Fit exposed connections accurately to form flush hairline joints

B. Interface with Adjacent Items:

1. Attachment: Provide materials, components, and accessories normally furnished or necessary to securely attach metal railings to supporting construction.
2. Field Welding:
   a. Comply with AWS quality standard publications for manual shielded arc welding procedures, appearance and quality of welds, and methods to correct faulty welds.
   b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

c. Before welding, grind to remove zinc coating from one to 4 inches from either side of the intended weld zone and on both sides of the item.
d. Obtain fusion without undercut or overlap.
e. Promptly remove welding flux.
f. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
g. Do not weld, cut, or abrade exterior surfaces hot-dip galvanized after fabrication and are for bolted or screwed field connections.
h. Field-weld connections indicated as exposed joints but cannot be shop-welded because of shipping size limitations.
i. Welds remaining exposed must be ground smooth and flush to match and blend with parent metal surfaces.
j. Clean field welds, weld spatter, bolted connections, and abraded areas promptly after installation.

C. Installation Tolerances: Install metal railings to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

D. Damaged Primer Touchup: Clean and prepare damaged primed surfaces in conformance with manufacturer's published instructions and SSPC surface preparation standard SSPC-SP11 "*Power Tool Cleaning to Bare Metal*".

1. Sand smooth and re-clean.
2. Spot-prime bare metal surfaces with specified primer applied to a total spot primer DFT of at least 5 mils.
3. Overlap undamaged primer areas with spot primer at least 2 inches.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 1000

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. PRESERVATIVE CHEMICALS: ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION AND CONTAINING NO ARSENIC OR CHROMIUM. DO NOT USE INORGANIC BORON (SBX) FOR SILL PLATES.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Grade as noted on plans.

B. Framing Other Than Non-Load-Bearing Partitions: Grade as noted on plans.

C. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailing.

3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Concealed Boards: 19 percent maximum moisture content and the following species and grades:
1. Western woods; Construction grade; WCLIB or WWPA.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

2.7 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
1. Use for interior locations unless otherwise indicated.

B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 1053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Utilitarian lumber and plywood not specified in other sections.
   2. Telephone and electrical equipment backing panels.
   3. Preservative treated wood.
   4. Fire-retardant treated wood.
   5. Rough hardware.
   6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. ACQ: Alkaline Copper Quaternary.
   2. APA: Means the Engineered Wood Association.
   3. ASME: American Society of Mechanical Engineers.
   4. AWPA: American Wood Protection Association.
   5. CCA: Chromium Copper Arsenate.
   6. FRTW: Fire Retardant Treated Wood.
   7. PTW: Preservative Treated.
   8. S4S: Surfaced Four Sides.
   9. WCLIB: West Coast Lumber Inspection Bureau.

B. Definitions:
   1. Manufacturer: Means the plywood, PTW, FRTW, rough hardware, or accessory manufacturer, as the context admits, unless otherwise indicated.
   2. Pressure-Treated Wood: Means either PTW or FRTW.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Provide fasteners and accessories suitable for the type of use and conditions of installation and service; and as required to produce secure attachment to supporting construction without staining or deterioration of either base materials or fastened materials; nor deterioration of the fastener itself when in contact with base materials and fastened materials.

1. Fastening Pressure-Treated Wood: Fasteners must resist corrosion when in contact with materials used in the pressure treating process that are either present at the time of installation or occur in the presence of moisture.
   a. Provide ceramic-coated anti-corrosive steel fasteners and hot-dip galvanized steel connectors conforming to ASTM A 653 Class G185 or provide Type 316 stainless steel fasteners and connectors.
   b. Fasteners and connectors made from uncoated (bare) carbon steel, electrodeposited zinc-coated steel, and aluminum are prohibited.
2. Other Exterior Locations: Provide ceramic-coated anti-corrosive steel fasteners or stainless steel fasteners.
3. Elsewhere: Fasteners may be coated or uncoated, as selected by the Contractor, unless otherwise indicated or specified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: For manufactured items, submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing rough carpentry attachment to supporting construction; and other conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples: When requested by the Architect, submit full-size samples of selected metal fasteners.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished rough carpentry.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature.
   5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to heat or sudden changes in temperature; or exposed to other sources of deterioration and damage.
C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective materials with undamaged new materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide lumber and plywood manufactured by one of the following, or equal.

1. Boise Cascade LLC.
2. Georgia-Pacific Wood Products LLC.
3. Louisiana-Pacific Corp.
4. Weyerhaeuser NR Co.

2.2 SAWN LUMBER

A. Timber for Wood Beams, Stair Stringers, and Posts: “SELECT STRUCTURAL” grade Douglas fir conforming to WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped showing only the appropriate fiber stress in bending “f”.

B. Rough Sawn Lumber: “#1” or “#2” grade Douglas conforming to WCLIB Grading Rules, rough sawn, dried to a moisture content of not more than 19 percent, and stamped “S-DRY” or “KD”.

C. Full-Dimension Lumber: “#1” or “#2” grade Douglas conforming to WCLIB Grading Rules, S4S, seasoned to a moisture content of not more than 19 percent, and stamped “S-DRY” or “KD”.

2.3 SOFTWOOD PLYWOOD

A. Softwood Plywood:

1. Minimum Sheathing Grade: “APA C-C Plugged & Touch Sanded EXT” grade plywood, unless otherwise indicated. Plywood panels must have a visible APA grade mark.
2. Minimum Underlayment Grade: “APA Tongue & Groove” grade plywood, unless otherwise indicated. Plywood panels must have a visible APA grade mark.
3. Minimum Size: At least 4- by 8-foot nominal sheet size.
4. Minimum Thickness: At least 1/2-inch nominal thickness, unless otherwise indicated.

5. Construction:
    a. 3/4-inch plywood: 7-ply veneer core.
    b. 1/2-inch plywood: 5-ply veneer core.
6. Panel Edges: Square-edged.

B. Telephone and Electrical Equipment Backing Panels:
1. Minimum Grades: “APA Type A-D” grade sanded plywood. Plywood panels must have a visible APA grade mark.
2. Minimum Thickness: At least 3/4-inch nominal thickness, unless otherwise indicated.
3. Construction: 7-ply veneer core.
4. Panel Edges: Square-edged.
5. Finish: Field-applied intumescent white paint finish. Paint both sides of plywood to prevent warping.

2.4 PRESERVATIVE TREATED WOOD (PTW)

A. Description: Wood products conforming to the AWPA U1 manufactured with ACQ wood preservative. PTW containing arsenic or CCA are prohibited.
1. Interior wood construction not in contact with the ground must conform to Use Category UC2.
2. Exterior wood construction not in contact with the ground must conform to Use Category UC3b.
3. Wood contacting the ground must conform to Use Category UC4a.

B. Application: Provide PTW at the following locations and where indicated.
1. Concealed rough carpentry items in contact with concrete or masonry.
2. Miscellaneous wood framing attached directly to the interior of below-grade exterior masonry or concrete walls.
3. Rough carpentry in contact with roofing, metal flashings, vapor retarders or barriers, air barriers, or waterproofing.
4. Wood framing members less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates installed on concrete slabs-on-grade.
6. Wood items exposed to weather.

C. Products: Provide the following manufactured by Sunbelt Forest Products Corp., or equal.
1. Termite Resistant Wood: “Timbersave PT”, or equal.
2. Decay and Termite Resistant Wood: “Preserve”, or equal.
3. Decay, Termite, and Water Resistant Wood: “Preserve Plus”, or equal.

D. Requisite Properties:
   1. Minimum Retention: At least 0.25 pounds per cubic foot in conformance with AWPA C2 for lumber and timber and AWPA C9 for plywood.
   2. Maximum Moisture Content: Kiln dry after treatment to a moisture content of not more than 19 percent for lumber, and not more than 15 percent for plywood.

2.5 FIRE-RETARDANT TREATED WOOD (FRTW)

A. Description: Wood products conforming to AWPA C20 and AWPA C27, manufactured with fire-retardant materials for which the fire-retardant manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested in conformance with ASTM D 5664 and ASTM D 5516.
   1. Provide exterior type wood at exterior locations.
   2. Provide Type A High Temperature (HT) wood at interior locations.
B. Application: Provide FRTW at the following locations and elsewhere where indicated.
   1. Framing for raised platforms.
   2. Concealed blocking.
   3. Roof construction.
   4. Plywood backing panels.
   5. Other wood items installed within fire-resistive construction.
   6. Elsewhere where indicated.
C. Restrictions: Fire-retardant products must not develop or advance metal fastener corrosion.
D. Products: Provide the following manufactured by Hoover Treated Wood Products, Inc., or equal
   1. Interior Locations: “Pyro-Guard”, or equal.
   2. Exterior Locations: “Exterior Fire-X”, or equal.

2.6 ROUGH HARDWARE

A. Uncoated (Bare) Carbon Steel Fasteners:
   1. Screws: Manufactured from carbon steel wire rods and uncoated coarse round wire conforming to ASTM A 510, Grades 1018 to 1022.
   2. Bolts: ASTM A 307, Grade A.
   3. Nuts and Flat Washers: ASTM A 563, Grade C3.

B. HDG Zinc-Coated Steel Fasteners:
   1. Description: Carbon steel fasteners with hot dip galvanized coating conforming to
      a. ASTM A 153 minimum zinc coating weight requirements for Class C materials (fasteners over 3/8-inch diameter and similar articles; washers 3/16-inch and 1/4-inch thick) or Class D materials (fasteners 3/8-inch diameter and under, rivets, nails and similar articles; washers under 3/16-inch thick); and
      b. ASTM F 2329 for coating of threaded fasteners and washers by hot-dip zinc galvanizing.
   2. Performance Requirements: No sign of surface red rust after at least 32 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
C. Stainless Steel Fasteners:
   1. Description: Austenitic stainless-steel screws, bolts, and studs conforming to ASTM F 593 and nuts conforming to ASTM F 594 requirements for Alloy Group 1 (304 Series) or Alloy Group 2 (316 Series).
   2. Performance Requirements:
      a. Type 304: No sign of surface red rust after at least 1,000 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
      b. Type 316: No sign of surface red rust after at least 1,500 hours of ASTM B117 salt spray test performed on screws after being driven through and removed from sheet metal panels.
D. Ceramic-Coated Anti-Corrosive Steel Fastener Material:
   1. Description: Carbon steel fasteners having 3-coat finish that provides electrolytic corrosion protection by combining the sacrificial protection of zinc with the barrier protection of a ceramic topcoat and having a current evaluation report from the ICC-ES demonstrating code compliance.
   2. Application: Use ceramic-coated anti-corrosive steel fasteners
      a. with pressure treated wood, including alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), copper azole (CBA-A and CA-B), copper citrate (CC), and disodium octaborate tetrahydrate (DOT);
      b. when attaching to exotic hardwood lumber base material;
      c. with composite lumber; and
      d. when attaching cement board, high-density exterior sheathing, and tile backer board to framing members at exterior walls, at high-moisture interior walls, and in high-corrosion environments.

3. Product: “Grabber” screws manufactured by Grabber Construction Products, or equal.
4. Requisite Properties:
   a. Basecoat An 8- to 10-micron (0.0003- to 0.0004-inch) mechanically deposited zinc-alloy coating.
   b. Intermediate Coat: Chromate conversion coating.
   c. Topcoat: Corrosion-resistant baked ceramic surface coating.
5. Performance Requirements: No sign of surface red rust after at least 1,000 hours of ASTM B 117 salt spray test performed on screws after being driven through and removed from sheet metal panels.

E. Nails, Brads, and Staples: Provide fasteners conforming to ASTM F 1667.
   1. Fastening Lumber to Lumber: Cement-coated or annular (ringed-shank) threaded nails of sufficient length to penetrate at least1-1/4-inches into adjoining items; or stove or lag bolts used with washers.
   2. Fastening Plywood to Lumber: Annular (ringed-shank) threaded nails; at least size 8d for 1/2-inch panels and at least size 10d for 3/4-inch panels.

F. Power-Driven Staples, Nails, P-nails, and Allied Fasteners: Must conform to ICC-ES Evaluation Report No. 1539.

G. Wood Screws: Must conform to ASME B18.6.1.

H. Steel Drill Screws for Fastening Wood to Cold-Formed Metal Framing: Must conform to ASTM C 954, except with wafer heads and reamer wings, length as recommended by the screw manufacturer for material being fastened.

I. Bolts:
   1. Steel Bolts: ASTM A 307 Grade A with hex nuts conforming to ASTM A 563, and flat washers where indicated.
   2. Anchor Bolts: ASTM F 1554 Grade 36. Provide hot-dip zinc-coated anchor bolts where item being fastened is galvanized.
   3. Lag Bolts: Must conform to ASME B18.2.1.

2.7 ACCESSORIES

A. Wood Glue:
   1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. Elmer’s Products Inc.
      b. Franklin International.
      c. Gorilla Glue, Inc.

3. Products: Provide the following manufactured by Franklin International, or equal.
    a. Interior Grade Glue: “Titebond Original” , or equal.
    b. Exterior Grade Glue: “Titebond III Ultimate”, or equal.
    c. Moulding and Trim Glue: “Titebond Quick & Thick Mutisurface Glue”, or equal.

B. Construction Adhesive:
1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
2. Product: “Titebond PROvantage” manufactured by Franklin International, or equal.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, or performance of installed and adjacent items.

C. Evaluation and Assessment:
1. Identify deficient and non-conforming project conditions.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for rough carpentry installation.
2. Set rough carpentry true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Sort and select lumber so natural characteristics do not interfere with installation or with fastening. Do not use materials with defects that interfere with function or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
2. Provide blocking and framing normally furnished, indicated, or required to support facing materials, fixtures, specialty items, and trim.
3. Provide metal clips for fastening gypsum board or lath at corners and intersections where blocking or framing does not provide a surface for fastening edges of panels. Do not space clips more than 16 inches on center.
4. Install wood furring, sleeper, blocking, grounds, nailers, and other items where indicated or required for attaching other work.
5. Make tight connections between members.
6. Select fasteners of size that will not fully penetrate members where opposite side is exposed to view or will receive finish materials.
7. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Do not countersink nail heads, unless otherwise indicated.
8. Install fasteners without splitting wood.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach rough carpentry to supporting construction.

D. Installation Tolerances: Install rough carpentry within the following tolerance variations.

1. Maximum Out of Plumb: Not more than 1/4-inch in 10 feet.
2. Maximum Out of Plane: Not more than 1/8-inch.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 06 1643
GMF GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. GMF gypsum sheathing.
   2. Installation materials.
   3. Joint treatment materials.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 21 16 for GMF gypsum board shaft wall liner and wall panels.
   2. Section 09 28 15 for GMF gypsum tile backing boards.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. GMF: Glass Mat Faced.

B. Definitions:
   1. Manufacturer: Means the sheathing manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling: Schedule installation to keep sheathing exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished sheathing.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Sheathing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Sheathing must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
   a. Sheathing manufactured outside of North America by a domestic company are prohibited.
   b. Sheathing manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company are prohibited.
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing sheathing for previous projects similar to this project in size, material, design, and complexity.

2. Supervisors: Individuals must have experience on previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading sheathing installers.

1.6 HANDLING

A. General: Comply with GA publication GA 801 "*Handling Gypsum Board*" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum sheathing products.

B. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

C. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to heat, sudden changes in temperature, and UV exposure beyond the manufacturer's limits; or exposed to other sources of deterioration and damage.
3. If items are not stored in an enclosed location, then cover the tops and sides of stored items with securely-tied, waterproof, breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited (due to potential accumulation of moisture beneath the tarpaulin during certain environmental conditions).
4. Incline covered items to ensure maximum drainage of accumulated moisture.

D. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

E. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

F. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide products manufactured by one of the following, or equal.
   1. CertainTeed Corp.
   2. Georgia Pacific Gypsum LLC.
   3. National Gypsum Co.
   4. USG Corp.

2.2 GMF GYPSUM SHEATHING

A. Description: Gypsum-based GMF commercial sheathing conforming to ASTM C 1177

B. Application: Installed to the outside face of above-grade exterior wall framing members to serve as a substrate for exterior wall finishes.

C. Restrictions: May not be used
   1. below grade;
   2. within roofing assemblies, including gypsum panels installed vertically within roofing assemblies on the roof side of parapet wall framing members as a substrate for the roofing membrane;
   3. as a backerboard for tile;
   4. as a structural product (may not be used in lieu of plywood where required);
   5. as a base for nailing or mechanical fastening; and
   6. for immersion in water or sustained exposure to water and moisture, including cascading roof or floor water, which must be directed away from the sheathing until appropriate drainage is installed.

D. Products: Provide one of the following, or equal.
   1. “GlasRoc Sheathing” manufactured by CertainTeed Corp.
      (ICC-ES Report No. ESR-2460)
   2. “DensGlass Sheathing” manufactured by Georgia Pacific Gypsum LLC.
      (ICC-ES Report No. ESR-3087)
   3. “Gold Bond e2XP Extended Exposure Sheathing” manufactured by National Gypsum Co. (ICC-ES Report No. ESR-2743)
   4. “SECUROCK Glass-Mat Sheathing Panels” manufactured by USG Corp.
      (ICC-ES Report No. ESR-3044)

E. Requisite Properties:
   1. Minimum Size: Provide at least 4-foot by 8-foot sheets.
   2. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
   3. Edges: Tapered long edges and square ends.
   4. Facers: Heat-cured, acrylic-coated, fiberglass mat wrapped around panel face, back side, and long edges. Water repellent paper facers and backings are prohibited.
   5. UV Exposure Limit: Cover within 270 calendar days.

2.3 INSTALLATION MATERIALS

A. Fasteners: Provide 0.164-inch shank diameter (#8-32 UNC) by at least 1-1/4-inch-long Philips drive socket, bugle or wafer head, self-drilling stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners, unless another fastener type is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.

2.4 JOINT TREATMENT MATERIALS

A. Sheathing Tape: Polypropylene panel joint tape is prohibited. (provides for short-term joint protection only)

B. Joint Sealant:
   1. Glass Mesh Tape Reinforcing:
      a. Description: At leash 2-inch wide, alkali-resistant, polymer-coated, 10x10 glass-fiber mesh tape. Polypropylene sheathing tape is prohibited.
      b. Application: Used in combination with joint sealant as a panel joint and penetration treatment for long-term joint protection.
      c. Product: Supplied, required, recommended, or accepted by the manufacturer.
   2. Sealant: Provide fluid-applied low modulus joint sealant specified in Section 07 92 00, unless another type of sealant; or supplied, required, recommended, or accepted by the manufacturer to seal sheathing joints and fastener penetrations.

C. Seam Seal Tape (Alternate):
   1. Description: 40-mil thick, self-adhering, cold-applied, rubberized asphalt/HDPE flexible flashing tape.
      a. Acrylic-coated polypropylene sheathing tape is prohibited.
      b. Glass mesh tape applied without sealant is prohibited.
   2. Application: Used as an alternate panel joint and penetration treatment for long-term joint protection.

3. Products: Provide the following manufactured by GCP Applied Technologies, or equal, unless another type of seam seal tape is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.
    a. Primer: “Perm-A-Barrier Primer Plus”, or equal, water-based primer required for cementitious and exterior gypsum sheathing substrates.
    b. Flashing Tape: “Perm-A-Barrier Wall Flashing”, or equal, self-adhesive, rubberized asphalt/polyethylene flashing tape.
    c. Maximum UV Exposure Limit: Cover within 60 days.

2.5 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
    1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
    2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
    1. Install sheathing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
    2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction

3. Installed sheathing must be warrantable. Do not install, correct, or replace sheathing in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Furnish units in longest available lengths to minimize end joints.
2. Pre-cut panels and make accurate cutouts for penetrations.
3. Position gypsum sheathing next to framing with coated side away from studs.
   a. Fit ends closely.
   b. Cut panel to required size and make cutouts.
   c. Leave 1/8-inch gap between penetrating items and panel edges.
4. Orient panels with long edge perpendicular to framing and short edges vertically oriented and centered over studs.
   a. Fit sheathing snugly around openings.
   b. Install panels with at least a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   c. Install panels with at least a 1/4-inch gap where they abut masonry or similar materials that may retain moisture.
   d. Do not bridge building expansion or seismic joints. Cut and space edges of panels to match framing spacing.
5. Accurately fit exposed connections to form flush hairline joints.
6. Securely fasten sheathing panels to framing.
   a. Stagger vertical joints at least 16 inches on center, but not less than one framing space between adjacent rows.
   b. Locate fasteners at least 3/8-inch from perimeter edges, and space fasteners a maximum of 8 inches on center, both along the panel perimeter and over the panel face.
   c. Drive fasteners to bear tightly against sheathing faces. Do not break or rupture facing, fracture underlying core or countersink fasteners.
   d. Do not use staples or adhesives to fasten sheathing to framing.
7. When sheathing panels are installed in sloped wall applications, the sloped portions of the wall must be temporarily protected with a weather-resistive barrier specified in Section 07 25 13 until cladding systems are installed.
8. Exposed wall ends, including tops of walls (parapets) must be covered to prevent water from infiltrating the wall assembly.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach sheathing to supporting construction.

D. Installation Tolerances: Install sheathing to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 PANEL AND PENETRATION JOINT TREATMENT

A. Panel Joint and Penetration Treatment for Long-Term Wind and Water Protection (Partially-Controlled Enclosure):

1. Promptly after sheathing is installed, apply glass mesh joint tape to panel joints and penetrating items promptly after sheathing is installed.
2. Center tape over sheathing panel joints and on perimeter openings surrounding penetrating items.
3. Provide an overlap at intersections at least equal to the tape width.
4. Apply at least a 3/8-inch continuous bead of sealant over the glass mesh joint tape, centered over sheathing panel joints; and to fasteners and perimeter of openings surrounding penetrating items.
5. With a trowel, compress and embed the sealant into the entire surface of the tape creating a continuous, flat, and level surface.
6. Fastener Treatment: Apply sealant or liquid flashing to each exposed fastener; trowel level and smooth.

B. Alternate Panel Joint and Penetration Treatment: As an alternate to sealant and glass mesh tape, specified seam seal tape may be provided when applied to properly prepared and primed sheathing surfaces in conformance with the seam seal tape manufacturer’s published installation instructions.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed sheathing in place from prolonged exposure to UV manufacturer's recommended limits, and other sources of deterioration and damage until covering. If exposed to UV for more than the recommended limit, then sheathing must be removed and replaced in conformance with the manufacturer's instructions.

B. Do not store anything adjacent to or against installed sheathing unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed sheathing as work surfaces.

C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 06 4016
INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated trim.
   2. Wood handrails and stair treads.
   3. Shop-fabricated door frames.
   4. Shop-fabricated interior custom wood doors.
   5. Shop-fabricated wood glazed assemblies.
   6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. HPVA: Hardwood Plywood and Veneer Association.
   2. MDF: Medium Density Fiberboard.
   3. WI: Woodwork Institute.

B. Definitions:
   1. Manufacturer: Means the panel or woodwork accessory manufacturer, as the context admits, unless otherwise indicated.
   2. Fabricator: Means the woodwork fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Schedule woodwork deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
   2. Install woodwork only after all other finishing operations are complete, especially overhead finishes.
   3. After woodwork installation, maintain ambient conditions within design range until Final Completion.

B. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate woodwork to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions specific to the project.
   b. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
3. Samples:
   a. Submit at least one 8-inch long or square representative fabrication sample for each woodwork type, color, finish, and variety, including core panel, facing, and edging.

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1.5 QUALITY ASSURANCE

A. Quality Standards:

1. Plywood Standard: Provide hardwood and decorative plywood conforming to American National Standards Institute/ Hardwood Plywood and Veneer Association (HPVA) document ANSI/HPVA HP-1, "*American National Standard for Hardwood and Decorative Plywood*".
2. Woodworking Standard: Provide woodwork conforming to Architectural Woodwork Institute/ Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Woodworkers and Finishers: Company or individuals must have experience fabricating woodwork installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing woodwork for previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must haveexperience installing woodwork for previous projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective woodwork with undamaged woodwork that does not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 SOFTWOOD LUMBER

A. Description: FSC-Certified dressed lumber, surface four sides (S4S) smooth without knife marks, unless otherwise indicated.

B. Requisite Properties:

1. Species: DesignSelections indicated on the Drawings or selected by the Architect, or equal.
2. Appearance Grade: Grade A.
3. Finish: Transparent finish in conformance with the referenced woodworking quality standard, Section 5 requirements for System 12. (water-based polyurethane)
   a. Stain: Indicated on the Drawings in the Finish Material Schedule.
   b. Sheen: Indicated on the Drawings in the Finish Material Schedule.

2.2 HARDWOOD LUMBER

A. Description: FSC-Certified dressed lumber, surface four sides (S4S) smooth without knife marks, unless otherwise indicated.

B. Requisite Properties:

1. Species: DesignSelections indicated on the Drawings or selected by the Architect, or equal.
2. Quality: Free of heart center (FOHC), unless otherwise indicated.
3. Grade: FAS or SELECT, determined by size.
4. Drying Designation: S-DRY. (“Surfaced Dry”; air dried to a moisture content less than 19 percent)
5. Net Finished Dimensions: Indicated on the Drawings.
6. Finish: Transparent finish conforming to the referenced woodworking quality standard, Section 5 requirements for System 12. (water-based polyurethane)
   a. Stain: ProductOptions indicated on the Drawings or selected by the Architect.
   b. Sheen: ProductOptions indicated on the Drawings or selected by the Architect.

2.3 WOODWORK FACINGS

A. Natural Wood Veneer Facing:

1. Description: FSC-Certified all heartwood raw veneer conforming to ANSI/HPVA quality standard publication requirements.

2. Supplier: Provide veneer supplied by one of the following, or equal.
    a. Dooge Veneers, Inc.
    b. Exotic Hardwoods and Veneers, Inc.
    c. R.S. Bacon Veneer Co.
3. Requisite Properties:
    a. Veneer Species: DesignSelections indicated on the Drawings or selected by the Architect.
    b. Minimum Veneer Face Grade: Grade A, unless otherwise indicated.
    c. Minimum Veneer Back Grade: Grade 1, unless otherwise indicated.
    d. Face Cut: Flat Cut (Plain Sliced), unless otherwise indicated.
    e. Grain Direction: Long direction, unless otherwise indicated.
    f. Veneer Match (sequenced leaf matching within each panel face): Book match, unless otherwise indicated.
    g. Number of Leaves per Panel: Indicated on the Drawings or selected by the Architect.
    h. Face Assembly Requirements (method of sequential veneer leaves matching within a panel): Center balanced, unless otherwise indicated.
    i. Panel Match Requirement (panel matching within an elevation): Blueprint match, unless otherwise indicated.
4. Finish: Transparent finish conforming to the referenced woodworking quality standard, Section 5 requirements for System 12. (water-based polyurethane)
    a. Stain: ProductOptions indicated on the Drawings or selected by the Architect.
    b. Sheen: ProductOptions indicated on the Drawings or selected by the Architect.

B. Composite Wood Veneer Facing:
1. Description: Prefinished, flexible, engineered composite wood veneer.
2. Manufacturer: Provide products manufactured by “Treefrog Veneer”, or equal.
3. Products: DesignSelections indicated on the Drawings or selected by the Architect, or equal.
4. Requisite Properties: ProductOptions indicated on the Drawings or selected by the Architect, or equal.
    a. Minimum Size: 4- by10-foot sheets, unless otherwise indicated.
    b. Thickness: At least 0.039-inch, unless otherwise indicated.

c. Color:
d. Pattern:
e. Finish:

5. Finish: Transparent finish conforming to the referenced woodworking quality standard, Section 5 requirements for System 12. (water-based polyurethane)
   a. Stain: ProductOptions indicated on the Drawings or selected by the Architect.
   b. Sheen: ProductOptions indicated on the Drawings or selected by the Architect.

C. Plastic Laminate Facing and Edgebanding:
1. Description: High-pressure decorative laminate (HPDL) conforming to NEMA LD-3.
   a. Exposed Surfaces: General purpose type HPDL Grade HGS. Toe bases are exposed surfaces, unless indicated as receiving an applied base. (e.g., a resilient base)
   b. Semi-Exposed Surfaces: Cabinet liner type HPDL, Grade CLS.
   c. Concealed Surfaces: Backer type HPDL, Grade BKV.
2. Standard Laminate Manufacturers: Provide products manufactured by one of the following, or equal.
   a. Lamin-Art, Inc.
   b. Formica Corp.
   c. Panolam Industries International, Inc.
   d. Wilsonart LLC.
3. Requisite Properties: ProductOptions indicated on the Drawings or selected by the Architect, or equal.
   a. Color:
   b. Pattern:
   c. Finish:

2.4 COMPOSITE FIBER PANELS

A. Medium-Density Fiberboard (MDF):
1. Description: Composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin.
2. Products: Provide the following manufactured by Roseburg Forest Products Co., or equal.
   a. Standard MDF: “Medite II”, or equal.
   b. Moisture-Resistant MDF: “Medex” , or equal.
   c. Flame-Resistant MDF: “Medite FR”, or equal.

3. Requisite Properties:
    a. Minimum Density: At least 50 pounds per cubic foot.
    b. Nominal Thickness: At least 1/2-inch, unless otherwise indicated.
    c. Minimum Grades:
        1) Thicknesses up to 3/8-inch: At least Grade 230.
        2) Thicknesses greater than 3/8-inch: At least Grade 150.

2.5 ACCESSORIES

A. Wood Edgebanding and Profile Wrapping:
    1. Manufacturer: Provide products manufactured by The Cloverdale Co., or equal.
    2. Veneer Edgebanding: “BAND-IT Real Wood Edgebanding”, or equal.
    3. Veneer Sheets: “BAND-IT Furniture Grade Veneer Sheets”, or equal.
    4. Requisite Properties:
        a. Species: Match veneer facing.
        b. Width: 3/4- or 7/8-inch; or 2 inches as required.
        c. Backing: Iron-on.

B. Wood Glue:
    1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
    2. Manufacturers: Provide products manufactured by one of the following, or equal.
        a. Elmer’s Products Inc.
        b. Franklin International.
        c. Gorilla Glue, Inc.
    3. Products: Provide the following manufactured by Franklin International, or equal.
        a. Interior Grade Glue: “Titebond Original”, or equal.
        b. Exterior Grade Glue: “Titebond III Ultimate”, or equal.
        c. Moulding and Trim Glue: “Titebond Quick & Thick Mutisurface Glue”, or equal.

C. Construction Adhesive:
    1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
    2. Product: “Titebond PROvantage” manufactured by Franklin International, or equal.

D. Finishing Nails:
   1. Description: 15-gage finish nails.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. DEWALT.
      b. PORTER-CABLE.
      c. SENCO.
   3. Requisite Properties:
      a. Point Style: Chisel or diamond point.
      b. Head Style: Brad.
      c. Interior Application Finish: Electro-galvanized.
      d. Exterior Application Finish: Stainless steel.
      e. Coating: Sencote.
E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 FABRICATION

A. Fabricate woodwork in conformance with AWI/AWMAC/WI quality standard publication requirements for Premium Grade.
B. Fabricate items to the dimensions, profiles, and details shown, and in conformance with the specified quality standard requirements, unless otherwise noted or indicated.
   1. Shop-assemble work in as large units as practicable to minimize field cutting and jointing.
   2. Where necessary to fit at the project site, allow ample allowance for cutting and fitting. Create sufficient scribe where items intersect walls and partitions.
   3. Conceal means of fastening various items together.
   4. Assemblies must be free from open joints, hammer and machine marks, structural defects, and surface blemishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify deficient and non-conforming project conditions.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for woodwork installation.
2. Set woodwork true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Install woodwork in a manner consistent with the specified grade; and plumb, level, true, and straight with no distortions.
2. Shim using concealed shims.
3. Secure to ground, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation.
4. At gypsum board construction, anchor through wall surface to wood blocking or wood studs only.
5. Furnish fillers, closures and trim as required for a complete installation. Scribe in place where required.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach woodwork to supporting construction.

D. Installation Tolerances: Install woodwork to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Remove from exposed woodwork surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible woodwork surfaces in a manner that does not result in any warranty or guarantee becoming void.
   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed woodwork in place from soiling, deterioration, and damage until Substantial Completion.
B. Do not store anything in, on, adjacent to, or against installed woodwork unless it is protected from damage. Do not use installed woodwork as work surfaces.
C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 06 4119
PLASTIC LAMINATE-CLAD WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated wood cabinets and casegoods.
   2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 12 36 63 for solid surface material countertops.
   2. Section 12 36 64 for quartz agglomerate countertops.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. 2DL: 2D Laminate.
   2. 3DL: 3D Laminate.
   3. RTF: Rigid Thermoformable Foils.
   4. HPL: High-Pressure Laminate.
   5. HPDL: High-Pressure Decorative Laminate.
   6. TFL: Thermally-Fused Laminate.
   7. CPA: Composite Panel Association.
   8. MDF: Medium Density Fiberboard.
   9. NEMA: National Electrical Manufacturers Association.
   10. WI: Woodwork Institute.

B. Definitions:
   1. Manufacturer: Means plastic laminate, finish hardware, or accessory manufacturer, as the context admits, unless otherwise indicated.
   2. Fabricator: Means the casework fabricator, unless otherwise indicated.

3. Self-Closing Hinge: Means a type of hinge that has a spring built into it so when a cabinet door starts to close, at some point the spring takes over and pulls the door closed with a tap.
4. Soft Closing Hinge: Means a type of hinge that has hydraulics built into it so when a cabinet door starts to close, at some point the hydraulics take over and ease the door closed silently; the cabinet door appears to glide closed.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate casework finish hardware with adjacent door hardware finishes.
   2. Coordinate casework design with countertops. Provide reinforcement as required to support countertops and backing. Countertops must not deflect to the point of cracking when subjected to in-service loads.

B. Shelving Performance Requirements:
   1. Design Load: Shelving must support at least 50 pounds per square foot uniformly distributed load; not more than 200 pounds total load per shelf.
   2. Deflection: Limit deflection under maximum design load to L/144, except that all shelving in the same room, or space must have the same thickness where not concealed by doors. Minimum shelving thickness must be at least 3/4-inch.
   3. Permanent Deformation: No permanent deformation at maximum design load after 48 hours continuous loading.

C. Sequencing:
   1. Schedule casework deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
   2. Install casework only after all other finishing operations are complete, especially overhead finishes.
   3. After casework installation, maintain ambient conditions within design range until Final Completion.

D. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate casework to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

2. Shop Drawings:

a. Submit dimensioned plans and elevations drawn to scale and showing casework layout and types. Show locations, sizes, and extents of all casework, accessories, and trim. Label manufactured items by product name.

b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions specific to the project. Cross-reference details to plans and elevations.

c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.

3. Samples: Submit at least one 8-inch square representative fabrication sample for each casework type, color, finish, and variety, including core panels, facings, and edgings.

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Operable parts for accessible casework must conform to the requirements of CBC Section 11B-309.

B. Quality Standards:

1. Woodworking Standard: Provide casework conforming to Architectural Woodwork Institute/Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.

C. Qualifications:

1. Woodworkers and Finishers: Company or individuals must have experience fabricating casework installed on projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing casework for projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
   1. Furnish adequate dunnage and bracing during storage.
   2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
   3. Do not leave items uncovered where they might become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
C. Handling: Handle items in a manner that that prevents damage.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective casework with undamaged casework that does not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOOD CASEWORK

A. Cabinets and Casegoods: Faced panel casework conforming to the referenced woodworking quality standard, Section 10 requirements for Custom Grade, Construction Type A (frameless) single-length cabinet sections with Interface Style 1 (flush overlay) cabinet doors and drawers.

2.2 SOFTWOOD LUMBER

A. Description: FSC-Certified dressed lumber, surface four sides (S4S) smooth without knife marks, unless otherwise indicated.

B. Requisite Properties:

1. Species: Douglas fir.
2. Appearance Grade: Grade B & Better.

2.3 FACED PANEL CONSTRUCTION

A. Plastic Laminate Facing and Edgebanding:

1. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

B. Countertop Substrate Panels:

1. Description: Moisture-resistant composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin.
2. Restrictions: Plywood, other than marine-grade plywood, is prohibited.
3. Products: “Medex” manufactured by Roseburg Forest Products Co., or equal.
4. Requisite Properties:
   a. Minimum Density: At least 50 pounds per cubic foot.
   b. Minimum Grade: At least Grade 150-MR 50.

C. Other Substrate Panels:

1. Description: Flame retardant composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin.
2. Restrictions:
   a. Plywood is prohibited for doors and drawers.
   b. When accepted in writing by the Architect, plywood may be used for casework boxes. (accepted by WI, though not recommended)
3. Products: “Medite FR” manufactured by Roseburg Forest Products Co., or equal.

4. Requisite Properties:
    a. Minimum Density: At least 50 pounds per cubic foot.
    b. Nominal Thickness: At least 1/2-inch, unless otherwise indicated.
    c. Minimum Grade: Grade 150.

2.4 FINISH HARDWARE

A. General:
    1. Provide all hardware indicated, specified, and necessary for a complete installation.
    2. Hardware finish must match the door hardware specified in Section 08 71 00, unless otherwise noted.

B. Manufacturers: Provide products manufactured by one of the following, or equal.
    1. Accuride.
    2. Blum, Inc.
    3. Doug Mockett & Co., Inc.
    4. Häfele America Co.
    5. Sugastune Corp.

C. Pulls:
    1. Description: Back-mounted pulls conforming to BHMA A156.9 Hardware Type No. A09021.
    2. Products: “DP128 Series” pulls manufactured by Doug Mockett & Co., Inc., or equal.
    3. Requisite Properties: ProductOptions indicated on the Drawings or selected by the Architect.
        a. Size:
        b. Finish:

D. Hinges:
    1. Description: Frameless concealed hinges (European cup style) conforming to BHMA A156.9, B01601 with integrated soft-close mechanism in the hinge cup. Spring-type self-closing hinges are prohibited.
    2. Product: “Salice Silentia Series” manufactured by Häfele America Co., or equal.

3. Requisite Properties:
    a. Provide hinges with between 95 and 100 degrees of opening for cabinets having retractable doors; and for cabinets next to walls or similar obstructions.
    b. Provide hinges with between 100 and 120 degrees of opening for cabinets requiring additional cabinet access.
    c. Provide hinges with between 165 and 175 degrees of opening for cabinets requiring the most cabinet access; and for installations where there are drawer pullouts in the cabinets.
    d. Provide at least 3 hinges for doors at least 24 inches wide or at least 36 inches high.
    e. Provide either screw- or rapido-mounted hinges.

E. Full Extension Drawer Slides:
1. Description: Heavy Duty full extension slides conforming to BHMA A156.9 Hardware Type No. B05091, with decelerated closing
2. Products: Provide the following supplied by Häfele America Co., or equal.
    a. Light Duty Side Mount Slides: “Accuride 2632” slides, or equal.
    b. Medium Duty Side Mount Slides: “Accuride 3832EC” slides, or equal.
    c. Heavy Duty Side Mount Slides: “Accuride 3657” slides, or equal.
    d. Medium Duty Bottom Mount Slides: “Accuride 3132EC Eclipse Easy-Close” slides, or equal.
    e. Heavy Duty S Bottom Mount Slides: “Accuride 9307” slides, or equal.
3. Grades:
    a. Light Duty Slides: Provide BHMA-certified Grade 1, rated to at least 50 pounds per pair, for pencil drawers; and rated to at least 75 pounds per pair for general purpose drawers.
    b. Medium Duty Slides: Provide BHMA-certified Grade 1HD-100, rated to at least 100-pounds per pair for file drawers up to 24 inches wide.
    c. Heavy Duty Slides: BHMA-certified Grade 1HD-200, rated to at least 200 pounds per pair for lateral file drawers greater than 24 inches wide.
4. Mounting Style:
    a. Provide side-mount slides for cabinet trays and drawers.
    b. Provide bottom-mount slides for cabinet pullouts and heavy duty storage platforms.

5. Finish: Indicated on the Drawings or selected by the Architect.
6. Accessories: Provide stops to prevent accidental removal.

F. Shelf Brackets:
1. Description: Spoon-shaped 1/4-inch nickel-plated steel shelf supports.
2. Product: “Item No. 282.04.739” manufactured by Häfele America Co., or equal.

G. Locks:
1. Description: Cylinder locks that separate the lock core from the cylinder housing, allowing any combination of locking systems.
2. Product: “Cylinder Module System” manufactured by Häfele America Co., or equal.
3. Requisite Properties:
   a. All cabinet doors and drawers must be lockable.
   b. Certain areas may be keyed separate. Everywhere else must be keyed the same.
   c. Provide master keying.

H. Grommets:
1. Standard Grommet Liner and Cap: “MM5A” solid brass grommet liner (fits a 2-7/8-inch hole) and “MM5” solid brass grommet cap (fits a 2-3/4-inch hole).
2. No Gap Small Grommets: “BRV1 Brava Grommet – Small”, or equal (fits a 2-3/8-inch hole size).
3. No Gap Large Grommets: “BRV2 Brava Grommet – Large”, or equal (fits a 3-5/32-inch hole size).
4. Trash Grommet: “TM-1 Steel” stainless steel trash grommet, or equal (fits a 6-inch hole size).
5. Finish: Satin Chrome.

2.5 ACCESSORIES

A. Cabinet Wastebin Pullout Frame:
1. Products: “Double Wastebin Pullout Frame” manufactured by KESSEBÖHMER, or equal.
2. Color: Champagne.

B. Base Cabinet Levelers:
   1. Description: 2-part adjuster and separate panel with steel spring clip screw-mounted to the toe kick panel.
   2. Products:
      a. Adjuster: “Item No. 637.19.228” manufactured by Häfele America Co., or equal. (4-3/4- to 5-1/2-inch toe kick height)
      b. Panel Clip: “Item No. 637.19.906” manufactured by Häfele America Co., or equal.
C. Fixed Shelf Brackets:
   1. Description: Steel shelf supports.
   2. Product: “Hebgo Bracket” manufactured by Häfele America Co., or equal.
   3. Requisite Properties:
      a. Minimum Sizes: ProductOptions indicated on the Drawings or selected by the Architect.
      b. Minimum Load Capacity: At least 300 pounds per pair.
      c. Finished: Factory primed for a field-applied finish.
D. Counter Supports:
   1. Description: Manufactured counter support brackets.
   2. Product: “Rakks EH Series - Counter Support Brackets” manufactured by Rangine Corp., or equal.
   3. Requisite Properties: ProductOptions indicated on the Drawings or selected by the Architect.
      a. Models:
      b. Mounting Configuration:
      c. Minimum Sizes:
      d. Surface Mount Configuration: At least 450 pounds.
      e. Flush Mount Configuration: At least 300 pounds.
      f. Standard Finish: Shop primed for a field-applied finish.
      g. Custom Finish: Custom powder coat finish matching the Architect’s design reference (target) sample.
E. PVC Edgebanding:
   1. Manufacturer: Provide products manufactured by Canplast, or equal.
   2. Product: DesignSelections indicated on the Drawings or selected by the Architect, or equal.

F. Wood Glue:
   1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. Elmer's Products Inc.
      b. Franklin International.
      c. Gorilla Glue, Inc.
   3. Products: Provide the following manufactured by Franklin International, or equal.
      a. Interior Grade Glue: "Titebond Original", or equal.
      b. Exterior Grade Glue: "Titebond III Ultimate", or equal.
      c. Moulding and Trim Glue: "Titebond Quick & Thick Mutisurface Glue", or equal.
G. Construction Adhesive:
   1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
   2. Product: "Titebond PROvantage" manufactured by Franklin International, or equal.
H. Finishing Nails:
   1. Description: 15-gage finish nails.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. DEWALT.
      b. PORTER-CABLE.
      c. SENCO.
   3. Requisite Properties:
      a. Point Style: Chisel or diamond point.
      b. Head Style: Brad.
      c. Interior Application Finish: Electro-galvanized.
      d. Exterior Application Finish: Stainless steel.
      e. Coating: Sencote.
I. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the fabricator for actual in-service conditions applicable to the project.
J. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.6 FABRICATION

A. Fabricate items to the dimensions, profiles, and details shown, and in conformance with the specified quality standards requirements, unless otherwise noted or indicated.
   1. Shop-assemble work in as large units as practicable to minimize field cutting and jointing.
   2. Where necessary to fit at the project site, allow ample allowance for cutting and fitting. Create sufficient scribe where items intersect walls and partitions.
   3. Conceal means of fastening various items together.
   4. Assemblies must be free from open joints, hammer and machine marks, structural defects, and surface blemishes.

B. Finish Hardware:
   1. Accurately fit hardware and install in conformance with the manufacturer's instructions.
   2. Accurately fit doors and drawers with uniform clearance at all edges.
   3. Doors and drawers must operate freely, but not loosely, without sticking or binding, with all hardware adjusted and functioning properly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
   1. Identify deficient and non-conforming project conditions.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for casework installation.
2. Set casework true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Install casework in a manner consistent with the specified grade; and plumb, level, true, and straight with no distortions.
2. Shim using concealed shims.
3. Secure to ground, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation.
4. At gypsum board construction, anchor through wall surface to wood blocking or wood studs only.
5. Furnish fillers, closures and trim as required for a complete installation. Scribe in place where required.

C. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach casework to supporting construction.
2. Casework taller than 42 inches must be seismically anchored.

D. Installation Tolerances: Install casework to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 ADJUSTING

A. Verify smooth and quiet door, drawer, and finish hardware operation.
B. Lubricate and adjust operating parts and finish hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.
C. Rehang or replace doors, drawers, and finish hardware that do not operate freely in a safe and reliable manner.

3.5 CLEANING

A. Cleaning Work: Remove from exposed casework surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible casework surfaces in a manner that does not result in any warranty or guarantee becoming void.
   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed casework in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything in, on, adjacent to, or against installed casework unless it is protected from damage. Do not use installed casework as work surfaces.

C. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 06 4600
INTERIOR WOOD TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop-fabricated wood standing and running trim and moldings.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. MDF: Medium Density Fiberboard.
2. WI: Woodwork Institute.

B. Definitions:

1. Manufacturer: Means MDF or accessory manufacturer, as the context admits, unless otherwise indicated.
2. Fabricator: Means the wood trim fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Schedule wood trim deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install wood trim only after all other finishing operations are complete, especially overhead finishes.
3. After wood trim installation, maintain ambient conditions within design range until Final Completion.

B. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate wood trim to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned elevations drawn to scale and showing wood trim layout and types. Show locations, sizes, and extents of all wood trim and accessories.
   b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions specific to the project. Cross-reference details to elevations.
   c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
3. Samples:
   a. Submit at least one 8-inch square representative fabrication sample for each wood trim type, finish, and variety, including core panels, facings, and edgings.

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Surface-Burning Characteristics: Provide wood trim having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

B. Quality Standards:

1. Woodworking Standard: Provide wood trim conforming to Architectural Woodwork Institute/ Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Woodworkers and Finishers: Company or individuals must have experience fabricating wood trim installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing wood trim for previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have experience installing wood trim for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading wood trim installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective wood trim with undamaged wood trim that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

F. Existing Conditions:
   1. Substrate Dimensional Tolerances: Surfaces receiving wood trim must be flat with 1/4-inch within any 10-foot radius.
   2. Illumination: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

PART 2 - PRODUCTS

2.1 WOOD TRIM

A. Description: Composite wood trim conforming to the referenced woodworking quality standard, Section 6 requirements for Custom Grade.

B. Medium-Density Fiberboard (MDF):
   1. Description: Flame retardant composite fiber panels conforming to ANSI A208.2 and made from 100-percent post-industrial recycled wood fiber and having no added urea-formaldehyde resin. Plywood is prohibited.
   2. Products: “Medite FR” manufactured by Roseburg Forest Products Co., or equal.
   3. Requisite Properties:
      a. Minimum Density: At least 50 pounds per cubic foot.
      b. Nominal Thickness: At least 1/2-inch, unless otherwise indicated.
      c. Minimum Grade: Grade 150.

C. Finish: Shop-applied opaque primer for field-applied finish.

2.2 ACCESSORIES

A. Wood Glue:
   1. Description: Yellow aliphatic resin polyvinyl acetate (PVA) glue.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. Elmer’s Products Inc.
      b. Franklin International.
      c. Gorilla Glue, Inc.
   3. Products: Provide the following manufactured by Franklin International, or equal.
      a. Interior Grade Glue: “Titebond Original”, or equal.
      b. Exterior Grade Glue: “Titebond III Ultimate”, or equal.
      c. Moulding and Trim Glue: “Titebond Quick & Thick Mutisurface Glue”, or equal.

B. Construction Adhesive:
   1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
   2. Product: “Titebond PROvantage” manufactured by Franklin International, or equal.
C. Finishing Nails:
   1. Description: 15-gage finish nails.
   2. Manufacturers: Provide products manufactured by one of the following, or equal.
      a. DEWALT.
      b. PORTER-CABLE.
      c. SENCO.
   3. Requisite Properties:
      a. Point Style: Chisel or diamond point.
      b. Head Style: Brad.
      c. Interior Application Finish: Electro-galvanized.
      d. Exterior Application Finish: Stainless steel.
      e. Coating: Sencote.
D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the fabricator for actual in-service conditions applicable to the project.
E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 FABRICATION

A. Fabricate items to the dimensions, profiles, and details shown, and in conformance with the specified quality standard requirements, unless otherwise noted or indicated.
   1. Shop-assemble work in as large units as practicable to minimize field cutting and jointing.
   2. Where necessary to fit at the project site, allow ample allowance for cutting and fitting. Create sufficient scribe where items intersect walls and partitions.
   3. Conceal means of fastening various items together.
   4. Assemblies must be free from open joints, hammer and machine marks, structural defects, and surface blemishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify deficient and non-conforming project conditions.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for wood trim installation.
2. Set wood trim true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Install wood trim in a manner consistent with the specified grade; and plumb, level, true, and straight with no distortions.
2. Shim using concealed shims.
3. Secure to ground, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation.
4. At gypsum board construction, anchor through wall surface to wood blocking or wood studs only.
5. Furnish fillers, closures and trim as required for a complete installation. Scribe in place where required.

C. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach wood trim to supporting construction.

D. Installation Tolerances: Install wood trim to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Remove from exposed wood trim surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible wood trim surfaces in a manner that does not result in any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed wood trim in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed wood trim unless it is protected from damage. Do not use installed wood trim as work surfaces.

C. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 1113
BITUMINOUS DAMPPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bituminous dampproofing.
2. Protection board and drainage panels.
3. Surface preparation.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the dampproofing manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected waterproofing with installed curing compounds and moisture vapor emission control systems, based on current product formulations.
2. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified dampproofing are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
   a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead.
   b. assume the manufacturer-recommended coverage rates govern; and
   c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

B. Sequencing:

1. Install dampproofing only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with dampproofing adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
2. Substrate repairs must be completed after surface preparation.
3. Install dampproofing only after penetrating items are installed.

C. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Primer Installation: Dampproofing must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
3. UV Exposure: Schedule installation to keep dampproofing exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished dampproofing.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Dampproofing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Dampproofing must be obtained only from a manufacturer that sends a representative to the project site before beginning work to verify existing conditions; and during work to perform manufacturer's field services.
3. Provide secondary materials, components, accessories, and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing dampproofing for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing dampproofing for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading dampproofing installers.
3. Manufacturer's Representative: Individuals must have technical field experience performing manufacturer's services for previous projects similar to this project in size, material, design, and complexity.

C. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. Install at least one 100-square-foot field sample of each dampproofing membrane installation to verify selections made under sample submittal and to set quality standards for installation. Demonstrate surface preparation, crack repair, and joint and corner preparation.
2. Test dampproofing membrane adhesion to verify surface preparation.
3. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.

4. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of dampproofing is made from field samples.
5. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
6. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective dampproofing materials with undamaged new dampproofing materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install dampproofing only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

1. Do not install dampproofing during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
3. Apply only as much dampproofing as can be made weathertight each day, including all flashing and detail work. Apply uninterrupted waterstops at the end of each day's work, and completely remove them before proceeding with the next day's work.

B. Existing Conditions: Surfaces receiving dampproofing must be dry. Install dampproofing only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

C. Other Conditions: Do not apply dampproofing where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Henry Co.
2. Tremco CPG, Inc.

2.2 BITUMINOUS DAMPROOFING

A. Description: Solvent-free, cold-applied, polymer-enhanced, asphalt emulsified dampproofing. Applications: Used for dampproofing concrete and masonry foundations and subgrade walls not subject to hydrostatic pressure; and for lining concrete and masonry planters.

B. Restrictions: Products conforming to ASTM D 1227, Type I (contains fillers or fibers including asbestos) are prohibited.

C. Product: “TremProof 260” manufactured by Tremco CPG, Inc., or equal.

D. Requisite Properties:

1. Minimum Thickness: 60 mis.
2. Maximum UV Exposure Limit: Not more than 30 calendar days.
3. Maximum High Temperature Application: Up to 120 deg. F.
4. Color: Black.

2.3 PROTECTION LAYERS AND DRAINAGE PANELS

A. Root Barrier: “HDPE-40 Protective Root Barrier”, or equal, installed between membrane and drainage board in areas that may become subject to exposure to invasive root structures.

B. Protection Course: “Tremco 2450”, or equal, extruded, hollow-core polypropylene/ polyethylene copolymer protection board.

C. Drain Panels:

1. Description: Prefabricated 3-dimensional dimpled-sheet geocomposite consisting of molded high-impact polystyrene core laminated to geotextile filter fabric.
2. Products: Provide the following manufactured by Tremco, Inc., or equal.
   a. Horizontal Installations: “TREMDrain 2000”, or equal.
   b. Vertical Installations: “TREMDrain 1000”, or equal.

D. Base Drain: “TREMDrain Total Drain” manufactured by Tremco, Inc, or equal.

2.4 ACCESSORIES

A. Primer: As supplied, required, recommended, or accepted by the manufacturer.

B. Elastomeric Transition Flashing: “Vulkem 350/351” manufactured by Tremco Inc., or equal.

C. Detail Membrane: “TRA Elastomeric Sheeting” manufactured by Tremco Inc., or equal.

D. Termination Bar:

1. Exposed Membrane Edge Locations: "Paraterm Termination Bar" extruded aluminum bar with upper flange to receive sealant.
2. Transitions to Other Waterproofing Membranes: Minimum 6-inch wide by minimum 1/8-inch thick stainless steel flat bar conforming to ASTM A 666, Type 316 No. 2D finish, having predrilled holes at maximum 12 inches O.C. for installation with stainless steel fasteners.

E. Fasteners: Stainless steel fasteners and at least 3/4-inch diameter washers installed in pre-drilled holes.

F. Joint Sealant: "Dynomic 100", or equal, single-component, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant.

A. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Open dampproofing containers only as required for use.

B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

C. Do not reduce, alter, or introduce foreign materials into dampproofing, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with dampproofing adhesion or performance.
3. Verify items penetrating dampproofing are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from the Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and dampproofing installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent dampproofing intrusion or migration.

B. Substrate Preparation:

1. Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
2. Remove substrate coatings and other substances that may negatively affect the quality of the installation, durability, or performance of furnished dampproofing.
3. Remove substrate ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve a smooth, flat, hard surface.

3.3 INSTALLATION

A. General Requirements:

1. Install dampproofing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install dampproofing under conditions that ensure dampproofing membrane is free from defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage.

3.4 FIELD QUALITY CONTROL

A. Manufacturer Services: Installed work is subject to examination by the manufacturer’s representative to determine conformance to manufacturer’s instructions and other requirements and recommendations.

1. Note all defective items and non-conforming work identified by the manufacturer’s representative.

2. Itemize into a punch list all noted items and record the manufacturer's requirements and recommendations for correcting each punch list item.
3. Promptly bring all punch list items into conformance with the manufacturer's requirements and recommendations until accepted in writing by the Architect.

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from the Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from the Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from the Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

A. Protect installed dampproofing in place from prolonged exposure to UV beyond manufacturer’s recommended limits, exposure to weather, becoming wet, contact with damp or wet surfaces, and other sources of deterioration and damage until covering dampproofing. If exposed to UV for more than the recommended limit, then dampproofing must be removed and replaced in conformance with the manufacturer's instructions.

B. Do not store anything on, adjacent to, or against installed dampproofing unless dampproofing is protected from damage, as accepted in writing by the manufacturer’s representative. Do not use installed dampproofed surfaces as work surfaces.

C. Remove protection when it’s no longer needed and before covering.

END OF SECTION

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SECTION 07 2150
BUILDING ENCLOSURE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stud bay concealed insulation.
   2. Installation materials.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 81 33 for acoustical insulation.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the insulation or accessory manufacturer, as the context admits, manufacturer, unless otherwise indicated.
   2. Thermal Transmittance (U-value): Means the measure of heat flux (flow of energy per unit of area per unit of time) and is expressed in units of BTU per hour square foot degrees Fahrenheit of air to air temperature difference between the two sides of a material (Btu/sq. ft. x h x deg. F).
   3. Thermal Resistance (R-value): Means the designation of an insulation material's resistance to heat flux. The R value is numerically equal to the reciprocal of the material's thermal transmittance, and is expressed in units of degrees Fahrenheit hour square foot per BTU inch at 75 degrees Fahrenheit (deg. F x h x sq. ft./Btu x in. at 75 deg. F).
   4. Concealed: Means hidden behind other construction when complete; and exposed surfaces in areas designated as shelled spaces.
   5. Exposed: Means remaining seen after construction is complete.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Fiberglass and mineral wool insulation may not be installed in direct contact with interior ventilation. Fiberglass and mineral wool insulation used in plenum spaces must be fully encapsulated.
   2. Plastic insulation must be separated from the building interior by a thermal/fire barrier that prevents the temperature rise to not more than 250 deg. F in a 15-minute time period.

3. Both board insulation and spray applied foam insulation manufactured with blowing agents known to have ozone depleting potential (ODP) are prohibited.

B. Performance Requirements: Above grade exterior perimeter walls must include insulation having a minimum R-value of at least R-21 for insulation material only, unless otherwise indicated.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished insulation.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped in their original packaging, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 PROJECT CONDITIONS

A. Existing Conditions: Surfaces receiving insulation must be dry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Blanket Insulation: Provide products manufactured by one of the following, or equal.

1. CertainTeed Corp.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning Fiberglass Corp.

B. Rock Wool Blanket Insulation: Provide products manufactured by one of the following, or equal.

1. Fibrex Insulations, Inc.
2. ROXUL, Inc.
3. Thermafiber, Inc.

2.2 CONCEALED STUD BAY INSULATION

A. Description: Asbestos-free mineral fiber blanket insulation conforming to ASTM C 665 requirements for Type I insulation (blankets without membrane coverings), manufactured from slag and naturally occurring rock.

B. Mineral Wool Blanket Insulation: Provide one of the following, or equal.

1. “COMFORTBATT” manufactured by ROCKWOOL International A/S.
2. “Thermafiber UltraBatt” manufactured by Owens Corning.

C. Requisite Properties:

1. Minimum Thermal Resistance: Provide material having an R-value of at least R-4.0 per inch of thickness.
2. Minimum Size: Provide sizes required for a self-supporting friction fit.
3. Minimum Thickness: 6 inches.
4. Minimum Density: 2.0 pounds per cubic foot.
5. Facing: None.

2.3 INSTALLATION MATERIALS

A. Insulation Hangers:

1. Application: Used to attach insulation to clean, dry, smooth, non-porous solid surfaces.
2. Manufacturer: Provide products manufactured by AGM Industries, Inc., or equal.
3. Products: Provide the following, or equal.
   a. Anchors: “TACTOO Insul-Hangers” adhesively attached spindle-type anchors.
   b. Adhesive: “BOSS 348 Multi-Purpose Construction Adhesive” manufactured by Accumetric, LLC or other VOC-compliant insulation hanger adhesive.
   c. Insulation Standoff: One-inch “Clutch Clip”.
   d. Insulation Retaining Washers: “Style RC 200” round or “SC 250” square washers.
4. Requisite Properties:
   a. Base Plate and Insulation Standoff and Retaining Washers: At least 2-inch square by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
   b. Retaining Washers: At least 1-1/2-inch square or diameter by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
   c. Spindle: At least 0.106-inch diameter (SWG 12), zinc-coated wire, depth to suit depth of insulation indicated.
   d. Adhesive: Adhesive used with impaling pins must either be manufactured or accepted by the insulation hanger manufacturer. “Peel and press” hangers with self-adhering adhesive backings are prohibited.

B. Mechanical Fasteners: Tape, staples, and other devices for fastening insulation supplied, required, recommended, or accepted by the insulation manufacturer.

C. Hanger Wire: At least 0.106-inch diameter (SWG 12) soft temper zinc-coated wire conforming to ASTM A 641, Class 3 or A coating.

D. Adhesive: Supplied, require, recommended, or accepted by the insulation manufacturer to bond insulation securely to substrates indicated without damaging insulation or substrates.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install insulation using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Extend insulation to envelop entire area insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
3. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
4. Installed insulation must be warrantable. Do not install, correct, or replace insulation in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Stud Bay Insulation: Install insulation in cavities formed by framing members.
   a. Use insulation that fills the cavities. If more than one length is required to fill the cavities, then provide lengths that will produce a snug fit between ends.
   b. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

c. Maintain 3-inch clearance around recessed lighting fixtures not rated for or protected from contact with insulation.
d. Stuff loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to roughly 40 percent of normal maximum volume.
e. For metal-framed wall cavities higher than 96 inches, support unfaced blankets mechanically and support faced blankets by taping insulation flanges to metal stud flanges.

2. Ceiling Insulation:
   a. Install blanket insulation above ceilings where indicated.
   b. Maintain 3-inch clearance of insulation around recessed lighting fixtures.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach insulation to supporting construction.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed insulation in place from becoming wet, deterioration, and damage until covering.

B. Do not store anything adjacent to or against installed insulation unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed insulation as work surfaces.

C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 07 2513
SHEET WEATHER-RESISTIVE BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Polyethylene sheet weather-resistive barriers.
   2. Asphalt-saturated sheet weather-resistive barriers.
   3. Self-adhering sheet flashings integral to sheet weather-resistive barriers.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 06 16 43 for treatment of sheathing panel joints.
   2. Section 07 65 26 for through-wall, opening, penetration, and transition SASM flashings, installation materials, and accessories not integral to WRB installation.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. WRB: Weather-Resistive Barrier.
   2. VDR: Vapor Diffusion Retarder.
   3. AB: Air Barrier.
   4. UV: Ultraviolet Solar Radiation.

B. Definitions:
   1. Manufacturer: Means the WRB manufacturer, unless otherwise indicated.
   2. Perm: Means a U.S. perm, or unit of permeance (water vapor transmission) at a given differential in partial pressures on either side of a material or membrane. The U.S. perm is defined as one grain of water vapor per hour, per square foot, per inch of mercury. One US perm is equivalent to 0.659045 metric perms.
   3. Shiner: Means lath or accessory fasteners that miss framing members.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: A preinstallation meeting is required for specified warranty.

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, or performance of installed WRBs. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

B. Sequencing:

1. Install WRBs only after penetrating items are installed.
2. Install WRBs only after openings are framed.

C. Scheduling:

1. UV Exposure: Schedule installation to keep WRB exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

2. Shop Drawings:
    a. Submit dimensioned drawings showing joints, seams, tie-ins, and dimensions, including terminations, penetrations, coves, interior and exterior corner conditions, openings, and expansion joints.
    b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
    1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished WRBs.
        a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
        b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
    2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
    3. Manufacturer's Representative Reports:
        a. Before beginning work, request and submit reports confirming substrates are properly prepared in conformance with manufacturer's instructions and other requirements and recommendations; are acceptable and satisfactory to receive the work of this specification section; and conform to all requirements necessary to issue specified and other warranties.
        b. During the work, request and submit reports documenting actions taken by the manufacturer's representative to verify conformance with manufacturer's instructions and other requirements and recommendations.
        c. Upon completion, request and submit reports confirming installed roofing conforms to all requirements necessary to issue specified and other warranties.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
    1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. WRBs must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing WRBs installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing WRBs for previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have experience installing WRBs for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading WRB installers.
4. Manufacturer's Representative: Individuals must have technical field experience performing manufacturer's services for previous projects similar to this project in size, material, design, and complexity.

C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate WRBs into the mockup as part of the work of this specification section.

D. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. Install at least one 100-square-foot field sample of each WRB installation to verify selections made under sample submittal and to set quality standards for installation. Demonstrate surface preparation, crack repair, and joint, and corner preparation.
2. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.

3. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of WRB is made from field samples.
4. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
5. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
   3. If items are not stored in an enclosed location, then cover the tops and sides of stored items with securely-tied, waterproof, breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath the tarpaulin during certain environmental conditions)
   4. Incline covered items to ensure maximum drainage of accumulated moisture.
   5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to heat, sudden changes in temperature, and UV exposure beyond the manufacturer's limits; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions:

1. Do not install WRBs during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.

B. Existing Conditions: Surfaces over which WRBs are installed must be dry. Install WRBs only when substrate moisture content falls within ranges required, recommended, or accepted by the manufacturer.

1.8 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 POLYETHYLENE SHEET WRB

A. Description: Non-woven, non-perforated, non-absorbing, breathable spunbonded HDPE WRB that that

1. resists air flow, bulk water, and wind driven rain;
2. channels water and moisture to the outside of the building envelope; and
3. has a current evaluation report from the NES or ICC-ES demonstrating code compliance when installed as a WRB.

B. Application: Installed on the exterior side of exterior building walls directly over the exterior wall sheathing as the base layer primary WRB. Windows, doors, and other openings must be flashed to this layer.

C. Products: “Tyvek CommercialWrap” (ICC-ES Report No. ESR-2375) manufactured by E.I. DuPont de Nemours & Co. (Dupont), or equal.

D. Requisite Properties:
   1. Minimum Basis Weight: At least 2.7 ounces per square yard, when measured in conformance with TAPPI Test Method T 410.
   2. Minimum Roll Width: 10 feet.
   3. Maximum UV Exposure Limit: Cover within 365 days.
E. Performance Requirements:
   1. Maximum Water Vapor Permeance: Not more than 23 perms, when measured in conformance with ASTM E 96, Procedure A.
   2. Minimum Water Resistance: At least 280, when tested in conformance with AATCC 127.
   3. Minimum Tensile Strength: At least 35 lbf per inch, when tested in conformance with ASTM D 882.
   4. Surface-Burning Characteristics: wall surfacing having a maximum FSI Value of 10 or less and a maximum SDI Value of less than 10 (Class A), when tested in conformance with ASTM E 84.
F. Accessories:
   1. Prefabricated Penetration Flashings: Provide products manufactured by Quickflash Weatherproofing Products, Inc.
   2. Primer: Supplied, recommended, or accepted by the manufacturer for each substrate.
   3. Straight Flashing Material:
      a. Description: 30-mil thick self-adhering flashing material with an elasticized polyethylene laminate face coated with butyl adhesive.
      b. Application: Applied to rectangular window flanges, sill plates, corners, and joints.
      c. Product: “StraightFlash”, or equal,
      d. UV Exposure Limit: Cover within 120 calendar days.
   4. Flexible Flashing Material:
      a. Description: 70-mil thick self-adhering elastic flexible flashing tape with a spunbonded polyethylene laminate face coated with butyl adhesive.
      b. Application: Applied to recessed and curved window flanges, sill plates, corners, and joints.
      c. Product: “FlexWrap NF”, or equal.
      d. UV Exposure Limit: Cover within 120 calendar days.
   5. Seam Tape:
      a. Description: Oriented polypropylene film coated with acrylic adhesive
      b. Product: “Tyvek Tape”, or equal.

6. Transition Flashing Material:
   a. Description: Used where WRB transitions to another system or parapet.
   b. Products: Specified in Section 07 65 26.
7. Fasteners:
   a. Metal Stud Construction: “Tyvek Wrap Cap” fastening system, including “Wrap Cap Screws” and 2-inch diameter “Wrap Cap” HDPE washers.
   b. Wood Stud Construction: “Tyvek Wrap Cap” fastening system, including #4 nails with large one-inch plastic cap fasteners.
8. Primer, Adhesive, and Other Accessories: Provide primer, adhesive, and other accessories and similar secondary items supplied, required, recommended, or accepted by the manufacturer and as necessary for a complete installation.

2.2 ASPHALT-SATURATED SHEET WRB

A. Description: Weather-resistant building paper conforming to Federal Specification FS UU-B-790a Type I (barrier paper), Grade D (water vapor permeable), Style 2 (uncreped, not reinforced, saturated) and having a current evaluation report from the NES or ICC-ES demonstrating code compliance when installed as a WRB.

B. Application: Installed on the exterior side of exterior building walls directly behind exterior Portland cement plaster to separate the plaster assembly from the base layer WRB.

C. Products: Provide one of the following, or equal.
   1. “Davis Wire 60 Minute” (ICC-ES Report No. ESR-2595) manufactured by Davis Wire Corp.
   2. “Super Jumbo Tex 60 Minute” (ICC-ES Report No. ESR-1027) manufactured by Fortifiber Corp.
   3. “GMCraft 60 Minute” (ICC-ES Report No. ESR-2376) manufactured by GMC Roofing & Building Paper Products, Inc.

D. Requisite Properties:
   1. Minimum Basis Weight: At least 6 pounds per 100 square feet (approximately 9.0 ounces per square yard).
   2. Minimum Roll Width: At least 40 inches.
   3. Maximum UV Exposure Limit: Cover within 30 days.

E. Performance Requirements:
   1. Minimum Water Vapor Permeance: At least 5 perms, when measured in conformance with ASTM E 96, Procedure B.

2. Minimum Water Resistance: At least 60 minutes, when tested in conformance with ASTM D 779.
3. Minimum Tensile Strength: At least 70 lb^f per inch, when tested in conformance with ASTM D 882.

F. Accessories:
1. Fasteners: At least one-inch-long, 16-gage, pneumatically-applied, coated galvanized steel crown staples
2. Sealing Material, Repair Tape, and Other Accessories: Provide mastic, adhesive, pressure-sensitive adhesive tape, and other items supplied, required, recommended, or accepted by the manufacturer and compatible with base layer WRB where in contact.

2.3 ACCESSORIES

A. Sealant:
1. Description: Silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25.
2. Product: “758” manufactured by Dow Corning Corp., or equal.
3. Color: White.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:
1. Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
2. Verify substrates are dry and free of deleterious and other substances that might interfere with WRB installation or performance.
3. Verify items penetrating WRBs are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install WRBs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed WRBs must be warrantable. Do not install, correct, or replace WRBs in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Placing:
   a. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner.
   b. Starting at the bottom of the wall, install WRB horizontally over sheathing and securely attach with a minimum of fasteners.
   c. Lap WRB in shingle fashion at least 3 inches at horizontal seams, and 6 inches at vertical seams. Stagger vertical joints. Shingle horizontal joints. Continuously tape all seams.
   d. To prevent direct contact between metal lath and accessories, and to ensure water tightness, lap the WRB over flanges of plaster accessories. Continue weather barrier uninterrupted behind plaster control joints.
   e. At areas to receive plaster provide asphalt saturated sheet WRB over base layer WRB, installed in conformance with the manufacturer's instructions.
   f. At areas where base layer WRB might be permanently exposed to UV light, provide UV stable sheet installed in conformance with the manufacturer's instructions.
   g. Integrate base layer WRB with flashing materials at windows, doors, and other penetrations to properly discharge water to the exterior face of the wall. Omitted or improperly installed flashing must be corrected prior to installing the WRB.

h. Seal all joints and penetrations through the WRB with flashing tape.
i. Continuously tape WRB at window and door openings, and to through-wall flashings.

2. Attachment: Fasten WRBs tight to substrates without wrinkles.
3. Penetrations: To create an airtight seal between penetrating items and WRBs, seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating WRBs with vapor-retarder tape.
   a. Cut WRB to fit closely and neatly.
   b. Continuously seal edges around penetrations.
4. Cladding Anchors: Apply 4- by 9-inch piece of approved flashing membrane to weather barrier membrane prior to the installation cladding anchors. Seal edges with weather barrier sealant.
5. Follow polyethylene sheet WRB manufacturer's instructions for WRB installations greater than 4 stories for the primary WRB.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to attach WRB tight and flat with as few fasteners as possible, and only enough to hold the WRB in place until the final wall finish material is installed.

3.3 FIELD QUALITY CONTROL

A. Manufacturer Services: Installed work is subject to examination by the manufacturer's representative to determine conformance to manufacturer's instructions and other requirements and recommendations. Manufacturer's field representative services are required for specified warranty.
   1. Note all defective items and non-conforming work identified by the manufacturer's representative.
   2. Itemize into a punch list all noted items and record the manufacturer's requirements and recommendations for correcting each punch list item.
   3. Promptly bring all punch list items into conformance with the manufacturer's requirements and recommendations until accepted in writing by the Architect.
   4. Manufacturer's representative withholds issuing warranties until all punch list items are accepted by the Architect.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

1. WRB Repair: Repair tears, holes and other damage with tape; or if too large, with at least 12-inch wide strips or remnants of WRB material centered over damaged areas and at least 6 inches larger all around, whichever is greater.
    a. Continuously tape or seal top layer edges of repair material to bottom layer.
    b. WRB must be free from holes, tears, and punctures at the end of installation.
2. Shiner Repair:
    a. Shiners are discovered by the installer as they miss the framing or observed from the interior before drywall is installed.
    b. Shiners must be removed, and WRB and sheathing holes filled with compatible sealant prior to patching WRB with compatible self-adhesive flashing.
    c. Do not leave shiners in place and seal over or rely on sealant as the only patching method.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
    1. written descriptions of non-conforming, damaged, and defective work;
    2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
    3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed WRBs in place from prolonged exposure to UV manufacturer’s recommended limits, exposure to weather, becoming wet, contact with damp or wet surfaces, and other sources of deterioration, and damage until covering. If exposed to UV for more than the recommended limit, then WRBs must be removed and replaced in conformance with the manufacturer's instructions.

B. Do not store anything adjacent to or against installed WRBs unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed WRBs as work surfaces.

C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 07 3200

ROOF TILES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Clay roof tile.
   2. Underlayment.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. NRCA: National Roofing Contractors Association.
   2. RTI: The Roof Tile Institute.
   3. WSRCA: Western States Roofing Contractors Association.

B. Definitions:
   1. Manufacturer: Means the roof tile manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:
   1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
   2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
   3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed roof tile. Resolve each condition.
   4. Finalize construction schedule.
   5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data:
      a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
      b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
   2. Shop Drawings:
      a. Submit dimensioned plans and elevations drawn to scale and showing roof tile layout, materials, construction, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
      b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
   3. Appearance Range Samples:
      a. Submit one set of samples for each tile color, finish, and variety, with each set consisting of at least three full-size tile samples exhibiting a representative total amount (degree) of expected (potential) variations in the appearance of finished work.
      b. Appearance range samples are intended as representative samples of actual finishes, colors, and patterns.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished roof tile.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

D. Maintenance Material Submittals:
   1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
   2. Furnish at least 2 percent of the total installed for each roof tile type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Roof tile must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
   1. Fire Resistance Rating: Roof coverings must conform to UL 790 fire resistance requirements for Class A rating. (effective against severe fire test exposures)

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*
   1. Manufacturer: Company or individuals must have experience manufacturing roof tile installed on previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have experience installing roof tile for previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have experience installing roof tile for previous projects similar to this project.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective roof tile with undamaged new roof tile that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 50 years; and for finishes against color fading, chalking, cracking, checking, peeling, and adhesive failure for 20 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 5 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Clay Tile Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Gladding McBean & Co.

2. Ludowici Roof Tiles.
3. MCA Clay Roof Tile.

2.2 CLAY ROOF TILE

A. Description: Molded or extruded clay roof tile units conforming to ASTM C 1167, shape and configuration indicated, kiln fired to vitrification, and free of surface imperfections. Furnish with fastening holes pre-punched at factory before firing.

B. Products: “MCA Corona Tapered Mission (C)” manufactured by MCA Clay Roof Tile, or equal.

C. Requisite Properties:
1. Overall Size: Indicated on the Drawings.
2. Exposure Size: Indicated on the Drawings.
3. Texture: Smooth surface.
4. Color: Selected by the Architect.
5. Finishing Tile: Provide manufacturer's standard trim, starter, roof edge, and similar tile units.

2.3 ACCESSORIES

A. Roofing Felt:
1. Description: Organic felt saturated with asphalt and covered on top with mineral surface fines.
2. Product: “Eagle True2-40” manufactured by Eagle Roofing, or equal.

B. Underlayment:
1. Base Layer: “Polyglass Polystick MTS Plus” manufactured by Polyglass U.S.A., Inc., or equal.
2. Top Layer: “Polyglass Polystick TU Plus” manufactured by Polyglass U.S.A., Inc., or equal.

C. Mortar: ASTM C 270, Type M, natural color for concealed-from-view mortar.

D. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

E. Elastomeric Sealant: ASTM C 920, silicone-based joint sealant; of Type M or S, Grade NS, Class 25, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

F. Screw Fasteners: Corrosion resistant fasteners formed from stainless steel and sized to penetrate deck minimum 3/4-inch or through thickness of deck or batten.

G. Flashing: As specified in Section 07 62 00.

H. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:
   1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
   2. Verify items penetrating roof tile are installed.

C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install roof tile using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed roof tile must be warrantable. Do not install, correct, or replace roof tile in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Underlayment Installation:
   a. General: Install underlayment in conformance with tile manufacturer's written recommendations and recommendations in NRCA publication, "*The NRCA Roofing and Waterproofing Manual*".
   b. Double-Layer Roof Felt Underlayment: Install perpendicular to roof slope in parallel courses. Install a 19-inch- wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
   c. Metal-Flashed Open-Valley Underlayment: Install 2 layers of 36-inch- wide roof felt underlayment centered in valley. Stagger end laps between layers at least 72 inches. Lap ends of each layer at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck with felt underlayment nails. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches.
2. Metal Flashing Installation:
   a. Install metal flashings and other sheet metal in conformance with requirements in Section 07 62 00.
   b. Install metal flashings in conformance with tile manufacturer's written recommendations and recommendations in NRCA publication, "*The NRCA Roofing and Waterproofing Manual*".
   c. Step Flashings: Install with 3-inch headlap extending over the underlying tile and up the vertical surface. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying tile. Fasten to roof deck only.
   d. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
3. Wood Nailers And Battens:
   a. Install wood nailers and securely fasten to roof deck.
   b. Install beveled wood cant at eaves and securely fasten to roof deck.
4. Tile Installation:

a. Install roof tiles in conformance with manufacturer's instructions and recommendations and in conformance with RTI/WSRCA publication, "*Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions*" and NRCA publication, "*The NRCA Roofing and Waterproofing Manual*".
b. Maintain uniform tile exposure and coursing of throughout roof.
c. Extend tiles 2 inches over eave fasciae.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach roof tile to supporting construction.

D. Installation Tolerances: Install roof tile within the following tolerance variations.
1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that offset are not allowed at welded joints.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: After installation, correction, and repair are complete, remove strippable film or other temporary protection. Promptly remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed roof tile in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed roof tile unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed roof tile as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 4213
FORMED METAL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formed metal panels.
2. Supporting framework.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the panel manufacturer, unless otherwise indicated.
2. Failure: Includes noise or vibration caused by movement, material deterioration beyond normal weathering, and water leakage through panel and framing areas.
3. Water Leakage: Means no uncontrolled water penetrating assemblies or water appearing on interior surfaces. Water leakage does not include water controlled by flashing and gutters that is drained to the exterior.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate building superstructure and design movement tolerances with panel manufacturing and erection tolerances. The manufacturer must accommodate building frame tolerances.

B. Performance Requirements:

1. General: Panels must establish and maintain a continuous watertight seal without failure.
2. Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".
3. Superstructure Deflection and Story Drift: Accommodate design displacement of adjacent stories indicated on the structural drawings.
4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.

5. Cladding Deflection: Individual panels may not deflect more than L/175 measured normal to the wall plane.
6. Wall Support Deflection: Sub-framing members may not deflect more than L/175, or 3/4-inch, whichever is less.
7. Permanent Deformation: Individual panels may not permanently deform more than L/100, when tested in conformance with ASTM E 330.
8. Water Leakage: No water leakage through the assembly or joints, when tested in conformance with both ASTM E 331 (uniform static air pressure test) and AAMA 501 (dynamic pressure test) at 12 pounds per square foot minimum differential pressure.
9. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
10. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified in Section 05 50 10.

C. Preinstallation Meeting:
1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed panels. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data:
a. Submit manufacturer’s product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing panel layout, materials, construction, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing panel supporting framework and attachments to supporting construction; penetrations, transitions, and terminations, including flashing and sealant installation; provisions for movement and for draining accumulated moisture within the assembly to the exterior; and other conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
3. Samples:
   a. Submit at least 12-inch long by full panel width representative samples of each panel type, color, finish, and variety.
   b. Submit samples of all supporting framework components (e.g. rails, clips, brackets, subgirts), necessary for a complete installation.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished panels.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Panels must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Panel assemblies must conform to the requirements of California Building Code section 1407 and have a maximum FSI Value of 25 or less and a maximum SDI Value of less than 10 (Class A), when tested in conformance with ASTM E 84.
2. Panels must be tested along with supporting framework and continuous or cavity wall insulation and found in conformance with National Fire Protection Association publication National Fire Protection Association publication NFPA 285, "*Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components*".

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing panels installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing panels for previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have experience installing panels for previous projects similar to this project in size, material, design, and complexity.

D. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate panels into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective panels with undamaged new panels that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years; and for finishes against color fading, chalking, cracking, checking, peeling, and adhesive failure for 20 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 FORMED METAL PANELS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 SUPPORTING FRAMEWORK

A. Metal Sub-Framing: Hat channels, C channels, Z girts, and other items indicated on the Drawings, all made from aluminum sheet conforming to ASTM B 209, Alloy 5005-H32 or Alloy 3003-H14.

B. Plastic Composite Sub-Framing: Z girts, attachment clips, and other items indicated on the Drawings, all designed to prevent metal-thermal bridging

   1. Z Girts: “GreenGirt – Simple Z” thermal attachment members manufactured by Advanced Architectural Products, or equal.

   2. Attachment Clips: “Cascadia Clip” thermal spacers manufactured by Cascadia Windows Ltd., or equal.

C. Backing Plates: Provide metal backing plates fabricated from material recommended by manufacturer.

D. Clips, Pins, and Fasteners: Concealed, non-corrosive, non-deteriorating clips, pins and fasteners of quantity and type required, recommended, or accepted by manufacturer and that are that are compatible with panel faces.

   1. Secure clips in the manufacturer’s facility as much as is reasonably practicable.

   2. Pop rivet attachment of clips and accessories is prohibited.

E. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce framing members as required to receive fastener threads.
3. Exposed fasteners are prohibited on faces exposed to view. Provide concealed fasteners and expansion provisions.

2.3 ACCESSORIES

A. Flashing: At least 0.0239-inch BMT (MSG 24) pre-painted steel sheet matching panels.

1. Provide flashing and trim required to seal against weather and to match finished appearance. Locations include bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers.
2. Finish flashing and trim with same finish system as adjacent panels.

B. Gaskets and Seals used in Panel Assembly: Supplied, required, recommended, or accepted by the manufacturer to conform to specified performance criteria; color selected by the Architect from manufacturer's standard colors.

C. Closures: Fabricated from same material as panels, and with same finish system as adjacent panels.

D. Edge Members and Perimeter Extrusions: Extruded aluminum at least 0.063-inch thick, with integral weather-stripping and finish matching adjacent panels.

E. Coped and Mitered Corners: Trimless structurally-bonded corners matching panel profile, shape, material, and finish; and without exposed fasteners.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 FABRICATION

A. Fabricate flashing and trim in conformance with SMACNA publication "*Architectural Sheet Metal Manual*" requirements for design, dimensions, metal, and other characteristics.

1. Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Fabricate cleats and attachment devices from the same material as the accessory being anchored, or from compatible, noncorrosive metal required or recommended by metal panel manufacturer.
3. Exposed fasteners are prohibited from faces of accessories exposed to view.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
2. Verify items penetrating panels are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install panels using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed panels must be warrantable. Do not install, correct, or replace panels in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach panels to supporting construction.

C. Installation Tolerances: Install panels within the following tolerance variations.
   1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
   2. Maximum Offset between Components at Joints: 1/16-inch except that offset are not allowed at welded joints.
   3. Maximum Misalignment of Adjacent Members: 1/16-inch.
   4. Maximum Bow: 1/8-inch in 48 inches.
   5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
   1. Damaged finishes must be restored so that no evidence remains of corrective work.
   2. Return to the factory those items that either cannot be refinished on-site, or that contain components that cannot be refinished on-site.
   3. either refinish the entire item or provide a new item

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: After installation, correction, and repair are complete, remove strippable film or other temporary protection. Promptly remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering. Clean all visible surfaces in a manner that does not result in any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed panels in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed panels unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed panels as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 5419
PVC ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. PVC membrane roofing.
   2. Roofing insulation and cover board.
   3. Installation materials.
   4. Site tests and inspections.
   5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the roofing manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Verify chemical and adhesive compatibility of selected roofing with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.

B. Roofing System Performance Requirements:
   1. Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".
   2. Design Wind Rating:
      a. Minimum Roof Field Area: 60 pounds per square foot.
      b. Roof Perimeter Area: 90 pounds per square foot.
      c. Roof Corner Area: 120 pounds per square foot.
   3. Design Negative Uplift Pressure:
      a. Roofing Membrane Installation: Conform to the requirements of FM Global Class I-90 wind uplift rating
      b. Adhered Insulation and Cover board Installations: Conform to the requirements of FM Global Class I-240.
      c. Mechanically-Fastened Insulation and Cover board Installations: Conform to the requirements of FM Global Class I-75.

4. Edge Securement: Membrane roof system metal edge securement (copings, fascias, gravel stops, etc.) must be designed, tested, and certified by the roofing membrane manufacturer to resist wind loads in conformance with ANSI/SPRI Standards ES-1, "*Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems*".

C. Solar Energy Performance Requirements:

1. Minimum Solar Reflectance Index (SRI) Value: At least SRI 0.82 for low-slope roofs (less than 2:12 slope) and 0.27 for steep slope roofs (greater than or equal to 2:12 slope), when measured in compliance with ASTM E 1918.
2. Minimum Aged Reflectance Value: At least 0.68 for low-slope roofs (less than 2:12 slope) and 0.28 for steep slope roofs (greater than or equal to 2:12 slope), when maintained under normal conditions and measured in conformance with ASTM E 1918.
3. Minimum Emittance Value: At least 0.85, when measured in conformance with ASTM C 1371.

D. Preinstallation Meeting:

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, or performance of installed roofing. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

E. Sequencing:

1. Install roofing only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with roofing adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
2. Substrate repairs must be completed after surface preparation.
3. Install roofing only after penetrating items are installed.

F. Scheduling:

1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Primer Installation: Roofing must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
3. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Shop Drawings:
   a. Submit project-specific dimensioned plans drawn to scale showing roofing installation. Show locations and extents of all items and accessories. Label manufactured items by product name.
   b. Submit tapered insulation plan showing insulation slopes and material thickness.
   c. Include project-specific dimensioned details drawn to scale showing substrate joints and cracks, flashings, coating penetrations, transitions, terminations, and other conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
3. Samples: Submit at least an 8- by 10-inch representative roofing sample for each specified variety, with a lapped seam in the center of each sample.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
    1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished roofing.
        a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
        b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
    2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
    3. Manufacturer's Representative Reports:
        a. Before beginning work, request and submit reports confirming substrates are properly prepared in conformance with manufacturer's instructions and other requirements and recommendations; are acceptable and satisfactory to receive the work of this specification section; and conform to all requirements necessary to issue specified and other warranties.
        b. During the work, request and submit reports documenting actions taken by the manufacturer's representative to verify conformance with manufacturer's instructions and other requirements and recommendations.
        c. Upon completion, request and submit reports confirming installed roofing conforms to all requirements necessary to issue specified and other warranties.
C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
    1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:
    1. Roofing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
        a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.

b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Fire Resistance Rating: Roof coverings must conform to UL 790 fire resistance requirements for Class A rating. (effective against severe fire test exposures)

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing roofing installed on previous projects similar to this project in size, material, design, and complexity.

2. Installer: Company or individuals must have experience installing roofing for previous projects similar to this project in size, material, design, and complexity.

3. Supervisors: Individuals must have experience installing roofing for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading roofing installers.

4. Manufacturer's Representative: Individuals must have technical field experience performing manufacturer's services for previous projects similar to this project in size, material, design, and complexity.

D. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. Install at least one 100-square-foot field sample of each roofing membrane installation to verify selections made under sample submittal and to set quality standards for installation. Demonstrate surface preparation, crack repair, and joint, and corner preparation.

2. Perform sheet moisture test in conformance with ASTM 4263.

3. Test roofing membrane adhesion to verify surface preparation.

4. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.

5. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of roofing is made from field samples.

6. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
7. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.
   1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer
   5. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
   6. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective roofing materials with undamaged new roofing materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install roofing only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

1. Do not install roofing during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
3. Apply only as much roofing as can be made weathertight each day, including all flashing and detail work. Apply uninterrupted waterstops at the end of each day's work, and completely remove them before proceeding with the next day's work.

B. Existing Conditions: Surfaces receiving roofing must be dry. Install roofing only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

C. Other Conditions: Do not apply roofing where dust is generated, or liquids are sprayed.

1.8 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer no-dollar-limit warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 20 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products manufactured by one of the following, or equal.

1. Carlisle SynTec.
2. Sika Sarnafil, Inc.

2.2 ROOFING MEMBRANE

A. Description: Feltback reinforced PVC roofing membrane conforming to ASTM D 4434, Type II, Grade 1.
   1. Unreinforced membranes are prohibited.
   2. Private l.abel and third-party-manufactured membranes are prohibited.

B. Product: “Sarnafil G410-60 Energy Smart” membrane manufactured by Sika Corp., or equal. (ICC-ES Report No. ESR-1157, Los Angeles Research Report No. RR 24852, and CRRC Product ID: 0674-0002a).

C. Requisite Properties:
   1. Thickness: 60 mils (1.5mm), when measured in conformance with ASTM D 638.
      a. Actual thickness must be at least 60 mils.
      b. Thickness variations permitted in ASTM D 4434 are prohibited for this project.
      c. At least 45 percent of the overall polymer actual thickness must be above the reinforcement scrim.
   2. Color: White.
   3. Backing: At least 9-ounce-per-square-yard factory-applied felt backing (fleece backed).
   4. Reinforcing Scrim: Fiberglass.
   5. Roof System Attachment Method: Fully-adhered system.

D. Performance Requirements:
   1. Minimum Tensile Strength: At least 1,500 pounds per square inch, when tested in conformance with ASTM D 638.
   2. Minimum Elongation: At least 250 percent (machine direction) and 200 percent (cross direction), when tested in conformance with ASTM D 638.
   3. Minimum Seam Strength: At least 75 percent of tensile strength, when tested in conformance with ASTM D 638.
   4. Minimum Tearing Resistance: At least 15 pounds-force, when tested in conformance with ASTM D 1004.
   5. Maximum Water Absorption: Not more than 2.0 percent by weight, when tested in conformance with ASTM D 570.

2.3 INSULATION AND COVER BOARD

A. Polyisocyanurate Insulation:
   1. Description: Rigid, closed-cell board insulation consisting of a polyisocyanurate (polyiso) foam bonded to glass fiber reinforced organic mat facers on both sides.

2. Products:
    a. Flat Insulation: “Sarnatherm”, or equal.
    b. Tapered Insulation: “Tapered Sarnatherm”, or equal.
3. Requisite Properties:
    a. Long Term Thermal Resistance: Assumed LTTR value of 5.6 per inch of thickness. If proposed insulation LTTR is less than 5.6 per inch, seek a written interpretation from the Architect to determine the necessary minimum thickness required to achieve specified R-values.
    b. Minimum Compressive Strength: At least 20 pounds per square inch, when measured at either 5 percent deformation or yield, whichever occurs first.
    c. Minimum Density: At least nominal 2.0 pounds per cubic foot when measure in conformance with ASTM 1622.
    d. Minimum Tapered Insulation Thickness: At least 1-1/2 inches.
    e. Tapered Insulation Main Slope: 1:48 (1/4-inch in 12 inches).

B. Cover Board:
1. Application: Used in horizontal applications as an overlayment for roof insulation and in vertical applications as a liner for the roof side of parapet walls.
2. Description: Commercial glass mat faced exterior sheathing conforming to ASTM C 1177 requirements for glass mat gypsum substrate.
3. Products:
    a. Bareback Adhered Membrane and Vertical Applications: “DensDeck Prime” manufactured by GP Building Products, or equal.
    b. Mechanically Fastened and Feltback Membrane Applications: “DensDeck” manufactured by GP Building Products, or equal.
4. Horizontal Applications: Provide 1/4-inch thick panels over insulation; provide at least 1/2-inch thick cover board directly over metal decks without insulation.
5. Vertical Applications: Provide 1/2-inch thick panels.
    a. 1/4-inch roof cover board and gypsum sheathing are prohibited for vertical applications.
    b. Roof cover boards installed in vertical applications (including as a liner for the roof side of parapet walls) must be installed by the same roofing installer that installs roof cover boards in horizontal applications (including as an overlayment for roof insulation).
    c. Non-conformance with the above may negatively affect the specified warranty.

6. Wall Backings:
    a. Light-duty wall backings specified in Section 05 40 00 must be installed to support reglets or termination bars in vertical applications, including on the roof side of parapet walls.
    b. Wall backings must be installed over metal stud framing members before the roofing installer installs roof cover boards.

2.4 INSTALLATION MATERIALS

A. Tape:
    1. Contaminated Material Locations: “Aluminum Tape”, or equal, aluminum foil tape with a pressure sensitive adhesive applied to one side for bonding to substrates.
    2. Elsewhere: “Multi-Purpose Tape”, or equal, high rubber content isobutylene-isoprene copolymer tape supplied, required, recommended, approved, or accepted by the manufacturer.

B. Adhesive: The following, or as supplied, required, recommended, approved, or accepted by the manufacturer for the substrate indicated and the environmental conditions under which the roofing membrane is installed.
    1. Insulation and Roof Cover Board Adhesive: “Sarnacol 2163 Board Adhesive” or “Sarnacol OM Board Adhesive”, or equal, 2-component foamable polyurethane adhesive.
    2. Bareback Membrane Adhesive: “Sarnacol 2121” water-based dispersion adhesive.
    3. Feltback Membrane Adhesive: “Sarnacol AD Feltback Membrane Adhesive” or “Sarnacol OM Feltback Membrane Adhesive”, or equal, 2-component foamable polyurethane adhesive.
    4. Flashing Adhesive: “Stabond U148A” low-VOC reactivating-type adhesive used to attach membrane to flashing substrate.

C. Sealant: “Sikaflex-1A”, or equal, single-component urethane sealant, or other sealant supplied, required, recommended, or accepted by the manufacturer.

D. Solvent Cleaner: “Sarnasolv” VOC-compliant solvent cleaner or other cleaning agent supplied, required, recommended, or accepted by the manufacturer.

2.5 ACCESSORIES

A. Vapor Retarder:
    1. Application: Used where indicated; or as a separation sheet between new roofing systems and existing roofing materials.

2. Products:
    a. Primer: “Sarnavap Self-Adhered Primer WB”, or equal, polymer emulsion-based primer.
    b. Fully-Adhered: “Sarnavap SA”, or equal, 32-mil thick self-adhesive SBS-modified bituminous vapor/air barrier sheet.

B. Flashing Membrane: “Sarnafil G410 Flashing Membrane”, or equal, fiberglass reinforced PVC membrane.
    1. Thickness: 60 mils (1.5mm).
    2. Color: Match roofing membrane color.

C. Membrane-Clad Flashings:
    1. Stainless Steel: “Sarnaclad-SS”, or equal, membrane-clad flashings consisting of at least a 34-mil thick roofing membrane material laminated to one side of at least 0.0250-inch thick (USSG 24) stainless steel. Except for 300 series stainless steel, uncoated and painted metal flashings and accessories are prohibited.

D. Liquid Flashing: “Liquid Flashing” 2-component PMMA-based material manufactured by Sika Corp., or equal.

E. Flashing Accessories:
    1. Reglets: “Sarnareglet”, or equal, 2-1/4-inch wide extruded aluminum profile with pre-drilled holes for anchors. Attach termination bar to substrate with stainless steel fasteners installed into the pre-drilled holes.
    2. Termination Bars:
        a. Attaching Membrane to Roof Deck or Walls and Curbs at Terminations, Penetrations, and at Incline Changes of the Substrate: “Sarnastop”, or equal, low profile, one-inch wide by 1/8-inch thick flat extruded aluminum bar having predrilled holes every 6 inches on center.
        b. Secondary Membrane Attachment for High Wind Conditions: “Sarnabar”, or equal, FMG-approved, heavy-duty, 14-gage, galvanized roll-formed steel bar having pre-punched holes every inch on center to allow various spacing options.
    3. Prefabricated Flashings:
        a. Prefabricated Corners: “Sarnacorners”, or equal, 60-mil prefabricated corners.
        b. Single-Pipe Penetration Pipe Boots: “Sarnastack Universal”, or equal, 60-mil thick prefabricated membrane flashings for flashing single rooftop vent stacks and pipes.

c. Single Penetration: “Open Post Flashing”, or equal, 60-mil thick prefabricated membrane flashings for flashing single obstructed rooftop conduits and pipes.
d. Multiple Penetrations: Provide cone or pelican hood flashing details fashioned from membrane-clad flashings or from roofing membrane material, as required, recommended, or accepted by the manufacturer.

F. Roof Walkways:
1. Description: High-percentage recycled content PVC rolled-out, heat-welded polyester-reinforced membrane walkway with non-slip chevron design.
2. Application: Used to protect roofing membrane from mechanical abuse.
3. Product: “Sarnatred - V”, or equal.
4. Requisite Properties:
a. Size: Nominal 39 inches wide by 50 feet long.
b. Thickness: 96 mils. (2.4mm)
c. Color: Light Gray.
d. Layout: Conform to the lengths and locations indicated on shop drawings.
e. Installation: Secure with loops of roofing membrane welded to field sheet.

G. Protection Layer:
1. Description: Fiberglass-reinforced recycled content PVC membrane at least 0.051-inch thick and applied to protect the roofing membrane from mechanical damage.
2. Product: “PVC Protection Layer”, or equal.

H. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: With installer and manufacturer's representative present, examine project conditions, including supporting and adjacent construction, and other conditions under which roofing is installed.

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with roofing adhesion, appearance, or performance.
3. Verify items penetrating roofing are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Substrate Preparation:

1. Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
2. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, or performance of furnished roofing.
3. Remove substrate ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface.

B. Termination and Penetration Preparation:

1. Prepare surfaces at terminations and penetrations through roofing and at expansion joints, drains, and sleeves in conformance with ASTM C 898 (horizontal applications) and the manufacturer's application instructions.
2. Prime substrates, unless otherwise required or recommended by the manufacturer.

C. Joint and Crack Preparation:

1. Differentiate between treatment of moving versus unmoving joints, and of cracks of different widths.

2. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 (horizontal applications), ASTM C 1471 (vertical applications) and the manufacturer's instructions. Before coating surfaces, remove dust and dirt from joints and cracks in conformance with ASTM D 4258.
    a. Comply with ASTM C 1193 for joint-sealant installation.
    b. Apply bond breaker between sealant and preparation strip.
3. Install sheet flashing and bond to the deck and wall substrates where indicated or required, and in conformance with the manufacturer's instructions. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate.

D. Substrate Acceptance:
1. Before starting installation, including priming, the manufacturer's representative must examine and certify that each prepared surface is
    a. properly prepared in conformance with the specifications, with the manufacturer's application instructions, and in a manner that does not void specified warranties; and
    b. satisfactory and ready to receive roofing.
2. Request and accommodate the manufacturer's representative's presence as required thereafter to review application progress, review completed work, and issue specified warranties.
3. Perform adhesion testing prior to start of work in each area.

3.3 INSTALLATION

A. General Requirements:
1. Install roofing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install roofing under conditions that ensure membrane is free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed roofing must be warrantable. Do not install, correct, or replace roofing in a manner that results in any warranty or guarantee becoming void.

B. Roof Insulation Special Techniques:
1. Install tapered insulation in conformance with the slopes indicated.
2. Install insulation to thickness required to conform to specified performance requirements. Where overall insulation thickness is 2.7 inches or greater, install 2 or more layers with joints of each succeeding layer staggered at least 6 inches in every direction from the previous layer's joints.

3. Trim surface of insulation at roof drains where necessary so that completed surfaces are flush and do not restrict flow of water.
4. Install insulation with long panel joints in a continuous straight line; and with end joints staggered between rows, abutting edges, and ends between boards.
    a. Fill gaps exceeding 1/4 inch with insulation.
    b. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

C. Adhered Insulation Base Layer Special Techniques: Install each layer of insulation and adhere to the substrate.
1. Adhesive Ribbons: Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
2. Full Spread Adhesive: Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

D. Adhered Tapered Insulation Special Techniques:
1. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
2. Adhere insulation in conformance with the requirements of FMG Approvals' "RoofNav" for specified Windstorm Resistance Classification.

E. Roof Cover Board Special Techniques:
1. Install cover boards over insulation with long joints in continuous straight lines; and with end joints staggered between rows.
2. Offset cover board joints at least 6 inches in every direction from insulation board joints below.
3. Loosely butt cover boards together.

F. Adhered Cover Board Special Techniques:
1. Comply with manufacturer's installation instructions for coverage rates, set times, and other adhesive application guidelines and requirements.
2. Adhere cover boards in conformance with the requirements of FMG Approvals' "RoofNav" for specified Windstorm Resistance Classification.

G. Roof Membrane Special Techniques:
1. Apply roofing membrane over area indicated as receiving roofing in conformance with the manufacturer's application instructions.
    a. Unroll roofing membrane and allow to relax before installing.
    b. Install sheet according to ASTM D 5036.

2. Begin roofing membrane application in the presence of the manufacturer's field representative.
3. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
4. Apply bonding adhesive to the substrate at rate required by the manufacturer. Do not apply bonding adhesive to splice area of the roofing membrane.
5. Roll felt backed membrane into adhesive coat immediately and while still wet. To ensure proper contact, compress bonded half of sheet to substrate with a water-filled, foam covered, lawn roller. Fold un-adhered half of membrane sheet back onto itself, and repeat the bonding procedure to complete bonding of sheet. Lay smooth in order to minimize wrinkles.
6. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
7. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
8. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
    a. Seam overlaps must be 3 inches wide when automatic machine welding and 4 inches wide when hand welding.
    b. Overlaps must be with the flow of water where possible.
    c. Welding equipment must be provided by or be approved by the membrane manufacturer. Mechanics intending to use the equipment shall have successfully completed a training course provided by a manufacturer's representative prior to welding.
    d. Membrane surfaces to be welded must be clean and dry in accordance with the manufacturer's instructions. No adhesives must be present in the lap areas.
    e. Test lap edges with probe to verify seam weld continuity.
    f. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
    g. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
    h. Grind edge of the membrane at corner laps as required to avoid pinholes at T-joints.

H. Hand-Welding Special Techniques: Hand-welded seams must be completed in three stages. Hot-air welding equipment must be allowed to warm up for at least one minute prior to welding.

1. The lap must be tack welded every 3 feet to hold the seam in place.
2. The back edge of the seam must be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
3. The nozzle must be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller must be positioned perpendicular to the nozzle and rolled lightly.

I. Machine Welding Special Techniques: Machine welded seams are achieved by the use of various automatic welding equipment.

1. When using this equipment, manufacturer’s instructions must be followed and local codes for electric supply, grounding and over current protection observed.
2. Automatic welding machines required 218 to 230 volts at 30 amps. Dedicated circuit house power or a dedicated portable generator is recommended.

J. T-Joint (Three-Way Lap) Special Techniques:

1. When welding a three-way overlap with membrane thicker than 1.5 mm, the top edge of the second membrane layer must be shaved down to create a smooth transition for the top membrane layer to conform to for positive welding.
2. Chamfer the edge of the membrane using means and methods acceptable to manufacturer.

K. Welded Seam Quality Control:

1. Completed welded seams must be checked by the installer after cooling for continuity using a rounded screwdriver or other suitable blunt object.
2. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of black material from the edge of completed joints.
3. On-site evaluation of welded seams must be made daily by the Contractor at locations as directed by the membrane manufacturer’s representative.
4. 2 inch wide cross-section samples of welded seams must be taken at least three times a day through completed seams.

5. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut must be patched by the Contractor at no extra cost to the Owner.
6. Welded seams must be left exposed until inspected and accepted by the membrane manufacturer.

L. Deck Drain Special Techniques Prime flange at deck drains and spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

M. Sealing Deck to Parapets: Seal the deck to the parapets and penetrations with urethane foam, suitable sealant, or self-adhesive vapor barrier in conformance with the manufacturer's installation instructions or other guidelines.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
   a. Schedule and arrange all tests and inspections.
   b. Coordinate all work and the final construction schedule with all tests and inspections.
   c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
   d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
   e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
   f. Witness all site tests and inspections.
   g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
   h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Required Tests:
   a. Moisture Testing: Perform sheet moisture test in conformance with ASTM 4263.
   b. Adhesion Testing: Before beginning work in each area, conduct adhesion tests with manufacturer's representative present at start of installation over each new substrate.

c. Weld Testing: To ensure properly-welded seams, perform test welds in the morning before starting, after lunch, and anytime there is a change in weather. Before Final Completion, deliver to the Owner signed, dated, and time stamped test welds as a condition of project closeout.

B. Manufacturer Services: Installed work is subject to examination by the manufacturer's representative to determine conformance to manufacturer's instructions and other requirements and recommendations.

1. Note all defective items and non-conforming work identified by the manufacturer's representative.
2. Itemize into a punch list all noted items and record the manufacturer's requirements and recommendations for correcting each punch list item.
3. Promptly bring all punch list items into conformance with the manufacturer's requirements and recommendations until accepted in writing by the Architect.
4. Manufacturer's representative withholds issuing warranties until all punch list items are accepted by the Architect.

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 CLOSEOUT ACTIVITIES

A. Manufacturer's Services: Before examination and acceptance of installed roofing by the manufacturer's representative, convene a meeting at the project site with the manufacturer's representative to review completed work and issue warranties.

   1. Invite all parties to attend that were either present at the preinstallation meeting, or that should have been present but were not in attendance
   2. Notify invitees at least 10 business days before convening the meeting.

3.8 PROTECTION

A. Protect installed roofing in place from deterioration and damage until covering.

B. Do not permit foot or vehicular traffic onto unprotected roofing membranes.

C. Do not store anything on, adjacent to, or against installed roofing unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed roofing as work surfaces.

D. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop- or field-fabricated flashings used for roofing and flashing applications.
   2. Delegated design of flashing assemblies.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 50 10 for dissimilar metal corrosion protection.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. BMT: Base Metal Thickness.msg
   2. HDG: Hot-Dip Galvanized.
   3. MSG: Manufacturer’s Standard Gage for Sheet Steel.
   4. USSG: United States Standard Gage for Sheet.
   5. NRCA: National Roofing Contractors Association.
   6. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

B. Definitions:
   1. Fabricator: Means the decorative flashing fabricator, unless otherwise indicated.
   2. Manufacturers' Standard Gage for Sheet Metal: Means the thickness steel sheet based on a weight of 41.82 pounds per square foot per inch of thickness.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate installation of roof perimeter flashings with installation of roof drainage system.
   2. Coordinate installation of counterflashing with installation of base flashings.

3. Coordinate installation of roof-penetration flashings with installation of roofing and other items penetrating roof.
4. Coordinate the installation of equipment support flashings with the installation of roofing and equipment.
5. Coordinate the installation of wall flashings with the installation of wall-opening components, including windows, doors, and louvers.

B. Delegated Design Requirements:
1. Engineer, fabricate, assemble, and install flashings that conform to the profiles indicated and other Contract Document requirements; meet specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

C. Performance Requirements:
1. Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*"..
2. Design Wind Rating:
   a. Minimum Roof Field Area: 60 pounds per square foot.
   b. Roof Perimeter Area: 90 pounds per square foot.
   c. Roof Corner Area: 120 pounds per square foot.
3. Design Negative Uplift Pressure: Coping system must conform to FMG requirements for at least a Class I-90 wind uplift rating.
4. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
5. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates.

D. Preinstallation Meeting:
1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation

3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed flashings. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data:
      a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings:
      a. Submit dimensioned plans and elevations drawn to scale and showing flashing layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
      b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
      c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
      d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
      e. Label each attachment type; indicate manufacturer's product name for each manufactured item.
      f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.

a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.

b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.

c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Quality Standard Requirements:

1. Design Standard: Comply with SMACNA publication "*Architectural Sheet Metal Manual*" requirements for design dimensions, geometry, metal thickness and other characteristics, and installation of flashings.

2. Installation Standard: Comply with NRCA publication "*Roofing and Waterproofing Manual*", Volume 2, "*Architectural Sheet Metal and Metal Roofing*" requirements for the design and installation of sheet metal flashing and trim items installed as part of roofing applications.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Fabricator: Company or individuals must have experience fabricating flashings installed on previous projects similar to this project in size, material, design, and complexity

2. Installer: Company or individuals must have experience installing flashings for previous projects similar to this project in size, material, design, and complexity.

3. Supervisors: Individuals must have experience installing flashings for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading flashing installers.

2. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate flashing into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.

   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.

   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

   3. Incline covered items to ensure maximum drainage of accumulated moisture.

   4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective flashings with undamaged new flashings that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot-Dip Galvanized and Galvannealed Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface, coating weight designation (mass designation) indicated below on both surfaces.

   1. Natural Finish (Galvanized): Provide material with at least a G90 coating weight, regular spangle, chemically treated (desired for humid-storage stain resistance; can still be painted; recommended for sheet that will be used unpainted), and oiled (intended as a corrosion inhibitor; sheet must be thoroughly cleaned to remove the oil prior to painting).

2. Shop-Painted Finish (Galvanized): Provide material with at least a G90 coating weight, minimized spangle, chemically treated (desired for humid-storage stain resistance; can still be painted; recommended for sheet that will be used unpainted), and oiled (for enhanced formability; sheet must be thoroughly cleaned to remove the oil prior to painting).
3. Field-Painted Finish (Galvannealed): Provide material with at least an A60 coating weight, not chemically treated, not oiled, and mill phosphatized (paint-grip finish; provides enhanced lubricating characteristics).

B. Stainless Steel Sheet:
1. Exposed Locations: ASTM A 666 (annealed and tempered), Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.
   a. Natural Finish: Furnish materials having a No. 2B (bright) finish.
   b. Painted Finish: Furnish materials having a No. 2D (matte) finish.
2. Concealed Locations: ASTM A 240 (annealed) Type 304L (for welded applications) or Type 304 (for all other applications), annealed, No. 2 (half hard) temper (hardness between Rockwell B-65 and B-70; can be bent 90 degrees across the direction of rolling around a radius equal to its thickness), passivated in conformance with ASTM A 967.
3. Natural Finish: Furnish materials having a No. 4 (bright) finish.

C. Aluminum Sheet: ASTM B 209, 5005-H32 (for anodic finishing) and 3003-H14 (for painted or unfinished sheet).

D. Pre-Painted Coated Steel Coil and Sheet: ASTM A 755.
1. Sheet: Hot-dip galvanized and galvannealed steel sheet.
2. Top Side Finish: 70-percent by weight liquid polyvinylidene fluoride (PVDF) coating system conforming to AAMA 2605 and consisting of a prime coat applied to a DFT of at least 0.2-mil and solid color coat applied to a DFT of at least 0.75-mil; or metallic color coat applied to a DFT of at least 0.75-mil and a clear top coat applied to a DFT of at least 0.50-mil.
3. Reverse Side Finish: 0.25-mil DFT acrylic bottom side primer and polyester wash coat (backercoat).
4. Painted Metallic Finishes: Panels, components, and accessories having a painted metallic finish must be finished such that the metallic finish directionality (grain) of all components runs in the same direction when installed. Color variation caused by failure to comply with this requirement is rejected as non-conforming work.

E. Copper Sheet, Strip, Plate, and Rolled Bar: ASTM B 152, UNS No. C11000 alloy (electrolytic tough pitch copper, 99.90 percent copper) or UNS No. C12200 alloy (phosphorous deoxidized, high residual phosphorous copper, 99.90 percent copper), tension-leveled to a flatness range of between 5 and 10 I-units or less.

F. Copper and Plate for Roofing, Flashing, Gutters, Downspouts, and General Sheet Metal Work in Building Construction: ASTM B 370, H00 temper (1/8 hard; recommended by CDA for most roofing and flashing installations) tension-leveled to a flatness range of between 5 and 10 I-units or less.

G. Lead Coated Copper Sheet and Strip: ASTM B 101.

2.2 ROOFING AND ROOF EDGE FLASHINGS AND TRIM

A. Description:

1. Copings: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
2. Gravel Stops: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
3. Scuppers and Conductor Heads: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
4. Gutters: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
5. Downspouts: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.

B. Requisite Properties:

1. Profiles, Edge Styles, and Attachments: Indicated on the Drawings.
2. Joint Style: J2. (butt and backup plate)
3. Fabrication: Provide standard profiles from the SMACNA quality standard publication, Chapter 1.
   a. Fabricate in sections between 8-and 10-feet long,
   b. Fabricate backup plates from the same material and thickness as copings.
   c. Miter corners, seal, mechanically fasten, and solder or weld watertight.
   d. All corners and transitions must be shop or factory fabricated. Corner pieces shall extend minimum 12 inches beyond corner in both directions.
   e. Only linear transitions may be field fabricated.
   f. Finish: Filed-applied duplex coating.

2.3 OTHER SHEET METAL FLASHINGS AND TRIM

A. Description:

1. Interlocking Counterflashing: Provide same material and thickness as reglets.
2. Through-Wall Flashings: Fabricate from at least 0.0250-inch thick (USSG 24) stainless steel sheet.
3. Opening Flashings in Framed Construction: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
4. Equipment Support Flashings: Fabricate from at least 0.0299-inch BMT (MSG 22) hot-dip galvanized and galvannealed steel sheet.
5. Overhead-Piping Drip Pans: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
6. Elevator Hoistway Guards: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet.
7. Backpans: Fabricate from at least 0.0359-inch BMT (MSG 20) hot-dip galvanized and galvannealed steel sheet, with equal coating weight on each surface, coating designation G90, not chemically treated, not oiled. Stiffen back pans as necessary to prevent “oil canning” or excessive deflection under load.
8. Flashings and Trim in Contact with Aluminum Components: Fabricate from at least 0.032-inch aluminum sheet.
9. Flashings and Trim in Contact with Concrete, Gravel, or Soil and Elsewhere Indicated: Fabricate from at least 26-ga. stainless steel Type 316 sheet.
10. Other Flashings and Trim: Unless otherwise noted, fabricate from at least 0.0299-inch BMT (MSG 22) hot-dip galvanized and galvannealed steel sheet; or from at least 0.0250-inch (USSG 24) Type 316 stainless steel sheet.

2.4 ACCESSORIES

A. Splash Pans: Standard precast concrete units cast from at least 4,000 pounds per square inch concrete. Precast units must have rounded corners and smooth and dense surfaces free of honeycombs.

B. Soldering Materials:

1. HDG Sheet Metal Solder and Flux: 50-percent tin solder conforming to ASTM B 32 Grade Sn50 and used with a non-corrosive flux.
2. Stainless Steel Sheet Metal Solder and Flux: 60-percent tin solder conforming to ASTM B 32 Grade Sn60 and used with an acid flux.

C. Fasteners: Provide fasteners and accessory materials suitable to the type of use and conditions of installation and service indicated; and as required for producing secure attachment to supporting construction without staining or deterioration of either the base materials or fastened materials; or deterioration of the fastener itself when in contact with base materials or fastened materials.
   1. Pop rivet attachment is prohibited.
   2. Provide fasteners are made of the same material as the fastened material or have a suitable barrier protection coating.
      a. Apply corrosion-inhibiting material (e.g., pastes, washers, compounds, etc.) under the heads of screws or bolts inserted into dissimilar metal, even if they are already treated or have a protective coating.
      b. Washers, gaskets, and sleeves must be made of plastic or closed-cell polychloroprene (Neoprene).
   3. Verify fasteners and accessories that are galvanically compatible with fastened materials under conditions of installation and service, as demonstrated by the fastener manufacturer based on testing and field experience. Do not use fasteners that are corrosive or otherwise incompatible with fastened materials.
   4. Where fasteners are subject to loosening or turning out due to thermal and structural movements, wind loads, vibration, and other causes, provide self-locking devices that either maintain tension in the fastener assembly or remain locked even if tension in the assembly is lost. (e.g. washers, locknuts, and similar items)
   5. Exposed fasteners are prohibited on faces exposed to view. Provide concealed fasteners and expansion provisions. Where unavoidable, provide flat head cap screws (type FHCS) with drive slots filled and finished flush and smooth with adjacent surfaces.
D. Underlayment:
   1. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/non-asphaltic butyl adhesive flashing membrane, with release liner on the adhesive side. Asphaltic adhesive flashing membranes are prohibited.
   2. Product: “Grace Ultra” manufactured by GCP Applied Technologies, or equal.
   3. Requisite Properties:
      a. Minimum Thickness: At least 30 mils.
      b. Minimum Roll Width: 36 inches.
      c. Maximum UV Exposure Limit: Not more than 100 days.
      d. Maximum High Temperature Application: Up to 300 deg F.

E. Sealant:

1. Exposed Sealant: “756 SMS” neutral-curing silicone sealant manufactured by Dow Corning Corp., or equal conforming to ASTM C 920.
2. Concealed Sealant: Single-component, solvent-release plasticized polyisobutylene (butyl rubber) conforming to ASTM C 1311; black color.
3. Sheet Metal Lap Sealant: “Sikaflex 15LM”low-modulus urethane sealant manufactured by Sika Corp., or equal.
4. Color: Selected by the Architect from the manufacturer’s standard colors.

F. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2-inch wide and 1/8-inch thick.

G. Bituminous Coating: Cold-applied asphalt emulsion conforming to ASTM D 1187.

H. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 FABRICATION

A. Shop Fabrication:

1. Before beginning fabrication, apply strippable film or other temporary protection normally furnished or necessary to protect metal from deterioration and damage during fabrication.
2. Fabricate items in largest sections practicable to minimize field jointing.
3. Fabricate flashing in thickness or weight needed to conform to the specified performance requirements, but not less than indicated for each application and metal.
4. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
5. Fabricate flashing without excessive oil canning, buckling, and tool marks; precise, straight, and true to line, size, shape, and levels indicated; with accurate angles and straight edges; and with exposed edges folded back to form hems.
6. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.

7. Inside and outside corners, and changes in direction, must be fabricated watertight assemblies with mechanically-fastened and continuously welded or soldered joints.
8. Form non-expansion, but movable, joints in metal to accommodate sealant. Where lapped expansion provisions cannot be used, form expansion joints with at least one-inch deep intermeshing hooked flange; fill with butyl sealant concealed within joints.
    a. Exposed fasteners are prohibited on faces exposed to view.
    b. Provide concealed fasteners and expansion provisions elsewhere.
9. Fabricate cleats and attachment devices from the same material as the item being anchored, of sizes as recommended by the SMACNA quality standard publication for the application, but not less than thickness of metal being secured
10. Do not use graphite pencils to mark metal surfaces.

B. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.
    1. Maximum Offset between Components at Joints: 1/8-inch except that at welded joints, offset are not allowed.
    2. Maximum Deviation from Slope and Location Lines: 1/4-inch in 20 feet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.

C. Evaluation and Assessment:
    1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
    2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
    1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for flashing installation.

2. Set flashings true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Install exposed flashings without excessive oil canning, buckling, and tool marks. Do not use graphite pencils to mark metal surfaces.
5. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
6. Fit exposed connections accurately to form flush hairline joints. Trim to fit substrates and to result in watertight performance. Torch cutting is prohibited.
7. Set sheet metal in bed of urethane sealant over concrete surfaces or coat with bituminous coating where compatible with overlying materials to prevent galvanic corrosion.
8. Install sealant tape where indicated.

B. Expansion Provisions: Provide provisions for thermal expansion.
1. Space movement joints not more than 10 feet on center. Joints may not be located within 24 inches of corners or intersections.
2. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints with intermeshing hooked flanges at least one inch deep, and fill with sealant concealed within the joints.
3. At exposed sheet metal fabrications, provide 8 in. wide splice plates. Set sheet metal laps in low-modulus urethane sealant. At sheet metal backing, provide 8-inch wide splice plates or at least 4-inch laps set in bed of low-modulus urethane sealant between pieces of sheet metal. Do not apply sealant to surface of joints.

C. Seal joints where indicated on the Drawings and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members at least one inch into the sealant. Form joints to completely conceal sealant.
2. When ambient temperature at the time of installation is between 40 and 70 deg. F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg. F.
3. Prepare joints and apply sealants in conformance with Section 07 92 00.

D. Soldered Joints:
   1. Soldered joints must also be mechanically fastened
   2. Clean surfaces to be soldered.
   3. Pre-tin sheet edges to at least 1-1/2 inches from the edge; reduce pre-tinning area where the pre-tinned surface might show in the completed work.
   4. Promptly remove acid flux residue from metal after tinning and soldering. Clean and neutralize in conformance with the solder manufacturer's installation instructions.
   5. Do not use torches for soldering.
   6. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
E. Special Techniques:
   1. Roof Drainage System: Install sheet metal roof drainage components as indicated to produce a complete roof drainage system conforming to the referenced standard.
   2. Roof Flashing: Install sheet metal flashing and trimin conformane with specified performance requirements, the SMACNA quality standard publication requirements. Provide concealed fasteners where possible, set units true to line, and level. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
   3. Roof Edge Flashing: Anchor to resist uplift and outward forces in conformance with the SMACNA quality standard publication and recommendations. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
   4. Copings: Anchor to resist uplift and outward forces in conformance with the SMACNA quality standard publication requirements and recommendations and roofing requirements.
      a. Interlock exterior bottom edge of coping with continuous cleat anchored to the supporting substrate at not more than 24-inches on center.
      b. Anchor the interior leg of copings with washers and screw fasteners through slotted holes at not more than 24 inches on center.
   5. Pipe and Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

6. Counterflashing: Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant.
7. Roof-Penetration Flashing: Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof. All penetrations must receive umbrella flashings.
8. Wall Flashing: Install sheet metal wall flashing as indicated, and to intercept and exclude penetrating moisture in conformance with the referenced standard's recommendations.
9. Opening Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend beyond wall openings as indicated on the shop drawings.
10. Miscellaneous Flashing:
    a. Equipment Support Flashing: Weld or seal flashing with elastomeric sealant to equipment support members.
    b. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated. Pipe and install drain lines to plumbing waste or drainage system as indicated on the plumbing drawings.

F. Interface with Adjacent Items:
1. Provide materials, components, and accessories normally furnished or necessary to securely attach flashing to supporting construction.
2. Provide provisions for thermal and structural movement.
3. Space cleats not more than 12 inches apart. Anchor each cleat with at least 2 fasteners. Bend tabs over fasteners.

G. Installation Tolerances: Shim and align flashing within an installed tolerance of 1/4-inch in 20 feet on slope and location lines indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: After installation, correction, and repair are complete, remove strippable film or other temporary protection. Promptly remove from exposed metal surfaces anything that might interfere with uniform oxidation or weathering.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

C. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed flashing in place from deterioration and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed flashings unless they are protected from damage. Do not use installed flashings as work surfaces.

C. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 6526
SASM FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. SASM through-wall, opening, penetration, and transition flashings that are not integral to WRB or AB installation.
   2. Roof and façade SASM underlayment.
   3. Installation materials.
   4. Surface preparation.
   5. Site tests and inspections.
   6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 06 16 43 for treatment of sheathing panel joints.
   2. Section 07 25 13 for self-adhering sheet flashings, installation materials, and accessories integral to sheet WRB installation.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. WRB: Weather-Resistive Barrier.
   2. VDR: Vapor Diffusion Retarder.
   3. AB: Air Barrier.
   4. SASM: Self-Adhering Sheet Membrane.
   5. UV: Ultraviolet Solar Radiation.

B. Definitions:
   1. Manufacturer: Means the flashing manufacturer, unless otherwise indicated.
   2. Roof: Means the top cover of a building having a slope of 60 degrees or less from the zero-degree horizontal plane.
   3. Non-Roof: Means the top cover of a building having slope more than 60 degrees from the zero-degree horizontal plane.
   4. Wall: Means one of the sides of a room or building connecting a floor and ceiling or foundation and roof, and having slope less than 30 degrees from the 90-degree vertical plane.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Performance Requirements: SASM flashing membranes installed around the perimeter of exterior opening assemblies and other penetrations must conform to Level 3 (elevated temperature exposure) requirements of American Architectural Manufacturers Association publication AAMA 711, *Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products*.

B. Coordination: Verify chemical and adhesive compatibility of selected flashings with installed waterproofing, WRBs, ABs, VDRs, roofing, sealants, and other items with which the flashings are in direct contact, based on current product formulations.

C. Preinstallation Meeting:

1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, or performance of installed WRBs. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

D. Sequencing:

1. Install flashings only after penetrating items are installed.
2. Install flashings only after openings are framed.

E. Scheduling:

1. Installations Requiring Primer: Flashings must be applied within 24 hours of primer installation. Schedule installation to limit exposure of primed surfaces to not more than 24 hours. Re-prime surfaces exposed for more than 24 hours in conformance with manufacturer's instructions for re-priming.
2. UV Exposure: Schedule installation to keep flashing exposure to UV within the manufacturer's recommended limits.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned drawings showing joints, seams, tie-ins, and dimensions, including terminations, penetrations, coves, interior and exterior corner conditions, openings, penetrations, and expansion and drift joints.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished flashings.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
3. Manufacturer's Representative Reports:
   a. Before beginning work, request and submit reports confirming substrates are properly prepared in conformance with manufacturer's instructions and other requirements and recommendations; are acceptable and satisfactory to receive the work of this specification section; and conform to all requirements necessary to issue specified and other warranties.

b. During the work, request and submit reports documenting actions taken by the manufacturer's representative to verify conformance with manufacturer's instructions and other requirements and recommendations.

c. Upon completion, request and submit reports confirming installed roofing conforms to all requirements necessary to issue specified and other warranties.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Flashings must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Flashings must be obtained only from a manufacturer that sends a representative to the project site before beginning work to verify existing conditions; and during work to perform manufacturer's field services.
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing flashings installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing flashings for previous projects similar to this project in size, material, design, and complexity.
3. Supervisors: Individuals must have experience installing flashings for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading flashing installers.
4. Manufacturer's Representative: Individuals must have technical field experience performing manufacturer's services for previous projects similar to this project in size, material, design, and complexity.

C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate flashings into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

   1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
   2. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
   3. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   4. Incline covered items to ensure maximum drainage of accumulated moisture.
   5. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install flashings only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

1. Do not install flashings during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.

B. Existing Conditions: Surfaces to which flashings are installed must be dry. Install flashings only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

C. Other Conditions: Do not apply flashings where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Carlisle Coatings and Waterproofing Inc.
2. GCP Applied Technologies.
3. Henry Co.

2.2 THROUGH-WALL SASM FLASHING

A. Standard Through-Wall Flashing:

1. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/rubberized asphalt adhesive flashing membrane, with release liner on the adhesive side, conforming to AAMA 711 requirements for self-adhered flashing materials.
2. Applications: Through-wall flashing for cavity wall applications.
3. Products: “Perm-A-Barrier Wall Flashing” manufactured by GCP Applied Technologies, or equal.
4. Requisite Properties:
   a. Minimum Thickness: At least 40 mils.
   b. Minimum Roll Width: At least 12 inches.
   c. Maximum UV Exposure Limit: Not more than 45 days.
   d. Color: Green with repeated logo imprint.

5. Performance Requirements:
    a. Maximum Water Vapor Transmission: Not more than 0.05-perm, when tested in conformance with ASTM E 96 method B.
    b. Minimum Pull Adhesion to Concrete: At least 60 pounds per foot, when tested in conformance with ASTM D 903 modified.
    c. Minimum Low Temperature Flexibility: Unaffected at minus 45 deg. F, when tested in conformance with ASTM D 1970.
    d. Minimum Elongation: At least 200 percent, when tested in conformance with ASTM D 412 die C modified.

B. Aluminum-Faced Detail Membrane:
1. Description: Aluminum-faced self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/rubberized asphalt adhesive, with release liner on the adhesive side, conforming to AAMA 711 requirements for self-adhered flashing materials.
2. Applications: Detail membrane for air and vapor barrier applications.
3. Restrictions: May not be used when aluminum facing might contact cementitious materials (e.g., Portland cement plaster) or dissimilar metals.
4. Products: “Perm-A-Barrier Aluminum Flashing” manufactured by GCP Applied Technologies, or equal.
5. Requisite Properties:
    a. Minimum Thickness: At least 40 mils.
    b. Minimum Roll Width: At least 9 inches.
    c. Maximum UV Exposure Limit: Not more than 270 days.
    d. Color: Natural finish aluminum.
6. Performance Requirements:
    a. Maximum Water Absorption: Not more than 0.1 percent, when tested in conformance with ASTM D 570.
    b. Minimum Puncture Resistance: At least 80 pounds, when tested in conformance with ASTM E 154.
    c. Minimum Elongation: At least 200 percent, when tested in conformance with ASTM D 412 die C modified.

2.3 OPENING AND PENETRATION SASM FLASHING

A. Standard SASM Flashing:
1. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/rubberized asphalt adhesive flashing membrane, with release liner on the adhesive side, conforming to AAMA 711 requirements for self-adhered flashing materials.

2. Applications: Deck-to-wall intersections, inside and outside corners of sheathing, wall-to-wall tie-ins, foundation sill plates, sheathing panel seams, and other non-roof detail areas.
3. Restrictions: May not be used
   a. in hot desert areas in the southwestern United States;
   b. in contact with with flexible PVC or vinyl windows; and
   c. with certain metal windows having integral nail fins.
4. Products: “Vycor Plus” manufactured by GCP Applied Technologies, or equal.
5. Requisite Properties:
   a. Minimum Thickness: At least 25 mils.
   b. Minimum Roll Width: At least 9 inches.
   c. Maximum UV Exposure Limit: Not more than 21 days.
   d. Color: Black-gray.
6. Performance Requirements:
   a. Maximum Water Vapor Transmission: Not more than 0.05-perm, when tested in conformance with ASTM E 96 method B.
   b. Minimum Pull Adhesion to Plywood: At least 3 pounds per inch, when tested in conformance with ASTM D 903 modified.
   c. Minimum Low Temperature Flexibility: Unaffected at minus 20 deg. F. , when tested in conformance with ASTM D 1970.
   d. Minimum Elongation: At least 250 percent, when tested in conformance with ASTM D 412 die C modified.

B. Aluminum-Faced SASM Flashing:
1. Description: Aluminum surfaced self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/rubberized asphalt adhesive, with release liner on the adhesive side, conforming to AAMA 711 requirements for self-adhered flashing materials.
2. Applications: Deck-to-wall intersections, inside and outside corners of sheathing, wall-to-wall tie-ins, foundation sill plates, sheathing panel seams, and other non-roof detail areas.
3. Restrictions: May not be used
   a. in hot desert areas in the southwestern United States;
   b. in contact with flexible PVC or vinyl windows;
   c. with certain metal windows having integral nail fins; and
   d. when aluminum facing may contact cementitious materials (e.g., Portland cement plaster) or dissimilar metals.
4. Products: “Vycor Aluminum Flashing” manufactured by GCP Applied Technologies, or equal.

5. Requisite Properties:
    a. Minimum Thickness: At least 25 mils.
    b. Minimum Roll Width: At least 6 inches.
    c. Maximum UV Exposure Limit: Not more than 350 days.
    d. Color: Natural finish aluminum.

C. Butyl SASM Flashing:
1. Description: Self-adhering cross-laminated polypropylene sheet/non-asphaltic butyl adhesive flashing membrane, with release liner on the adhesive side, conforming to AAMA 711 Level 3 requirements for elevated exposure self-adhered flashing materials. Asphaltic adhesive flashing membranes are prohibited.
2. Applications: Used for flashing around window and door headers, sills, jambs, thresholds, and nailing flanges; and under exterior plaster (stucco) trims.
3. Products: “Vycor PRO” manufactured by GCP Applied Technologies, or equal.
4. Requisite Properties:
    a. Minimum Thickness: At least 14 mils.
    b. Minimum Roll Width: At least 9 inches.
    c. Maximum UV Exposure Limit: Not more than 100 days.
    d. Color: White with green paint.

2.4 SASM UNDERLAYMENT

A. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/non-asphaltic butyl adhesive flashing membrane, with release liner on the adhesive side. Asphaltic adhesive flashing membranes are prohibited.

B. Applications: Roof detail areas, including under equipment flashings, as ice dam protection, at roof valleys and rake edges, and around chimneys and skylights.

C. Restrictions: May not be used
1. in contact with polysulfides;
2. in contact with flexible PVC or vinyl windows; and
3. with high concentrations of resin (pitch) that may be found in some wood plank decks.

D. Products: “Grace Ultra” manufactured by GCP Applied Technologies, or equal.

E. Requisite Properties:
1. Minimum Thickness: At least 30 mils.
2. Minimum Roll Width: 36 inches.

3. Maximum UV Exposure Limit: Not more than 100 days.
4. Maximum High Temperature Application: Up to 300 deg F.
5. Color: Gray-black.

F. Performance Requirements:
1. Minimum Membrane Tensile Strength: At least 250 pounds per square inch, when tested in conformance with ASTM D 412, Die C modified.
2. Minimum Membrane Elongation: At least 250 percent, when tested in conformance with ASTM D 412, Die C modified.
3. Minimum Low Temperature Flexibility: Unaffected to at least -2 deg. F , when tested in conformance with ASTM D 1970.
4. Minimum Adhesion to Plywood: At least 3.0 pounds per inch of width, when tested in conformance with ASTM D 903.
5. Maximum Permeance: Not more than 0.05-perm, when tested in conformance with ASTM E 96 method B

2.5 INSTALLATION MATERIALS

A. Liquid Flashing:
1. Description: Trowel grade, asphalt modified urethane.
2. Application: Used as repair material for defects on concrete surfaces; as fillet and reinforcement material at inside corners; as flashing material at outside corners and around drains, protrusions, curbs and parapets; and as sealing material at membrane terminations.
3. Product: “Bituthene Liquid Membrane” manufactured by GCP Applied Technologies, or equal.

B. Green Concrete Primer:
1. Description: Low-VOC solvent-based primer.
2. Applications: Used to prime green concrete cured less than 7 days; and to prime damp concrete, masonry, sheathing or wood surfaces to which SASMs are applied.
3. Product: “Bituthene Primer B2 LVC" manufactured by GCP Applied Technologies, or equal.

C. Sheathing Primer:
1. Description: Water-based primer.
2. Application: Used to prime fiber cement and GMF gypsum sheathing.
3. Product: “Perm-A-Barrier WB Primer” manufactured by GCP Applied Technologies, or equal.

2.6 ACCESSORIES

A. Sealant:

1. Description: Silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25.
2. Product: “758” manufactured by Dow Corning Corp., or equal.
3. Color: White.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with flashing adhesion, appearance, or performance.
3. Verify items penetrating flashings are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Substrate Preparation:

1. Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

2. Remove substrate coatings and other substances that may negatively affect the quality of the installation, durability, or performance of furnished flashings.
3. Remove substrate ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface.

3.3 INSTALLATION

A. General Requirements:
1. Install flashings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install flashings under conditions that ensure they are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed flashings must be warrantable. Do not install, correct, or replace flashings in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Accurately align flashing membranes and maintain uniform side and end laps at least 3 inches or as specifically depicted in the project details. Apply flashing membranes with side laps shingled in the direction of bulk water flow.
2. Clean seam areas, overlap flashing membranes, and roll side and end laps in conformance with the flashing manufacturer's installation instructions to ensure a watertight seam installation.
3. Press and form material tightly against the substrate.
   a. Pressure is essential to eliminate wrinkles and bubbles.
   b. Ensure complete and continuous adhesion by using a hard neoprene or stainless steel hand roller.
   c. Apply sealant or liquid membrane at flashing membrane leading edges.
4. Install flashing around windows in the following order.
   a. Install in conformance with details indicated on Drawings.
   b. Install in conformance with the flashing membrane manufacturer, and the door and window manufacturers’ installation instructions.
   c. Install in conformance with ASTM E 2112.

5. Install flashing under copings over wall flashing, WRBs, and roof membranes.
    a. Provide aluminum-faced flashing separation at incompatible materials.
    b. Lap joints at least 3 inches.
    c. Hand-roll seams for complete adherence to substrate.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach flashing to supporting construction.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
    a. Schedule and arrange all tests and inspections.
    b. Coordinate all work and the final construction schedule with all tests and inspections.
    c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
    d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
    e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
    f. Witness all site tests and inspections.
    g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
    h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Adhesion Testing: Before beginning work in each area, conduct adhesion tests with manufacturer's representative present at start of installation over each new substrate.

B. Manufacturer Services: Installed work is subject to examination by the manufacturer's representative to determine conformance to manufacturer's instructions and other requirements and recommendations.
   1. Note all defective items and non-conforming work identified by the manufacturer's representative.
   2. Itemize into a punch list all noted items and record the manufacturer's requirements and recommendations for correcting each punch list item.
   3. Promptly bring all punch list items into conformance with the manufacturer's requirements and recommendations until accepted in writing by the Architect.
   4. Manufacturer's representative withholds issuing warranties until all punch list items are accepted by the Architect.

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.
   1. Repair punctures, tears, voids, and deficient lapped seams that do not conform to specified requirements. Slit and flatten fishmouths and blisters.
   2. Extend patches 6 inches beyond repaired areas in all directions. Seal edges with sealant or liquid membrane.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

A. Protect installed flashings in place from prolonged exposure to UV manufacturer’s recommended limits, exposure to weather, becoming wet, contact with damp or wet surfaces, and other sources of deterioration, and damage until covering flashings. If exposed to UV for more than the recommended limit, then flashings must be removed and replaced in conformance with the manufacturer's instructions.

B. Do not store anything on, adjacent to, or against installed flashings unless they are protected from damage, as accepted in writing by the manufacturer’s representative. Do not use installed flashings as work surfaces.

C. Remove protection when it’s no longer needed and before covering.

END OF SECTION

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SECTION 07 7200
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof-field mounted attic ventilation system.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 05 05 23 for non-structural metal fastenings.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the roof accessory manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished roof accessories.

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Roof accessories must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications:*(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*
   1. Installer: Company or individuals must have experience installing roof accessories for previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have experience installing roof accessories for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading roof accessory installers.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective roof accessories with undamaged new roof accessories that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

A. Description:
B. Products: "Clay Tile Vents High Profile Fire & Ice (S)" manufactured by O'Hagin, or equal.
C. Requisite Properties:
   1. Material: 16-ounce copper.
   2. Finish: "Terra Cota".
   3. Subflashing: 6-inch flange subflashing.

2.2 ACCESSORIES

A. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install roof accessories using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed roof accessories must be warrantable. Do not install, correct, or replace roof accessories in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach roof accessories to supporting construction.

C. Installation Tolerances: Install roof accessories to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 07 8400
FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Through-penetration firestop systems.
   2. Fire-resistive joint systems (fire calks).
   3. Perimeter fire-resistive joint systems (fire safing).
   4. Surface preparation.
   5. Installation materials.
   6. Site tests and inspections.
   7. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 81 33 for firestop putty pads.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. UL: Underwriter's Laboratories.

B. Definitions:
   1. Manufacturer: Means the firestopping manufacturer, unless otherwise indicated.
   2. Fire Partition Means construction designed and tested to resist the passage of fire for a prescribed time, specifically at fire barriers, fire walls, shafts, exit enclosures, smoke barriers, corridor construction and other construction assemblies.
   3. L-Rating: Means the amount of air or cold smoke that can leak through a penetration, when tested in conformance with UL 1479.
   4. F-Rating: Means the time a penetration firestop system prevents the passage of fire through a penetration, when tested in conformance with ASTM E 814 or UL 1479.

5. T-Rating: Means the time a firestop system, including the penetrating item, limits the maximum temperature rise to 325 deg. F above its initial temperature through the penetration on the non-fire side, when tested in conformance with ASTM E 814 or UL 1479.
6. Assembly Rating: Means the combination of T- and F-ratings in an assembly, with F equaling T, when tested in conformance with ASTM E 1966 or UL 2079.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Assisted by the selected manufacturer, choose firestopping components, products, and materials that correspond to selected firestopping systems shown by reference designations to
   a. Underwriters Laboratories, as listed in UL publication, "*Fire Resistance Directory*".
   b. Intertek's ETL SEMKO Division, as listed in its Omega Point Laboratories publication, "*Directory of Listed Building Products, Materials, & Assemblies*".
2. Where modifications to tested assemblies are necessary to suit project conditions or address applications for which there are no tested systems, obtain engineering judgments from the firestopping manufacturer derived from similar qualified tested system designs and other testing.
   a. Submit engineering judgments for review and approval and obtain written acceptance of modifications prior to submitting shop drawings to the Architect.
   b. Engineering judgment documents must conform to International Firestop Council for Evaluating Firestop Systems Engineering Judgments requirements.
3. Coordinate openings and penetrating items to ensure installed firestopping conforms to specified requirements and the selected firestop system testing laboratory designation.
   a. Coordinate sizing of sleeves, openings, core-drilled holes, and cut openings to accommodate firestop systems in conformance with the manufacturer's requirements and recommendations.
   b. Provide exposed firestopping material colors selected by the Architect from the standard color range currently available from the manufacturer. Custom colors are prohibited.

B. Acoustical Requirements: Provide non-hardening resilient firestop material at penetrations, sleeves, and passthroughs in acoustic construction assemblies.

C. Sequencing: After firestopping installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

2. Shop Drawings: Submit project-specific key plans showing firestopping installations.

3. Firestopping Schedule: Submit firestopping schedule indicating firestopping types, laboratory tested assembly numbers, protected elements including sizes, materials, and minimum hourly fire-resistance rating for each fireproofed item. Cross-reference firestopping schedule to key plans.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished firestopping.

   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Firestopping must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing firestopping for previous projects similar to this project in size, material, design, and complexity. Installers and supervisors must be:
   a. authorized, certified, licensed, or otherwise qualified by the manufacturer as having the necessary experience, personnel, and training to install or apply the manufacturer's products, including all related components and accessories; and
   b. Only personnel trained and certified by the manufacturer in the proper installation or application techniques may supervise or perform any of the work of this specification section.
2. Supervisors: Individuals must have experience installing firestopping for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading firestopping installers.

C. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of firestopping is made from field samples.

3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective firestopping materials with undamaged new firestopping materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install firestopping only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

1. Do not install firestopping during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
3. Do not apply firestopping when
   a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
   b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
   c. surface temperatures are 5 deg. F or less above the dew point.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving firestopping must be dry. Install firestopping only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. 3M Fire Protection Products.
2. Hilti, Inc.
3. Specified Technologies, Inc.

2.2 FIRESTOPPING ASSEMBLIES

A. Description:

1. Through-Penetration Firestop Systems: Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHEZ, or equal.
2. Fire-Resistive Joint Systems (fire calks): Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHBN, or equal.
3. Perimeter Fire-Resistive Joint Systems (safing insulation): Provide firestop systems tested and identified in UL's "*Fire Resistance Directory*" product Category XHDG, or equal.

B. Requisite Properties:

1. F-Rated Firestop Systems: Provide firestop systems in fire partitions having an F rating that meets or exceeds the fire-resistance rating of the penetrated construction, but not less than one-hour.
2. T-Rated Firestop Systems: In fire-resistive floor-ceiling or roof-ceiling construction, or other constructions where penetrating items pass through occupied areas and may contact combustible materials, provide firestop systems having both an F- and a T-rating, determined in conformance with ASTM E 814 or UL 1479. T-rated assemblies are required where the following conditions exist with exceptions.
   a. Where firestop systems protect floor penetrations located outside of wall cavities.
   b. Where firestop systems protect floor penetrations located outside fire-resistive shaft enclosures.
   c. Where firestop systems protect penetrations located in fire-resistive construction containing doors required to have a temperature-rise rating.
   d. Where firestop systems protect penetrating items larger than a 4-inch diameter nominal pipe or 16 square inches in overall cross-sectional area.
3. L-Rated Firestop Systems: Where firestop systems are indicated in smoke barriers and elsewhere, provide penetration firestop systems with an L-rating of not more than 5.0 cubic feet per minute per square foot both at ambient temperatures and at 400 deg. F.
4. Firestopping Exposed to Traffic, Moisture, or Physical Damage: Provide products that do not deteriorate after curing.
5. Plumbing and Wet-Pipe Sprinkler System Piping Penetrations: Provide moisture-resistant penetration firestop systems.
6. Penetrations with Insulated Piping: Provide penetration firestop systems that do not require piping insulation removal.

7. Floor penetrations with Annular Spaces Exceeding 4 inches Wide and Exposed to Possible Loading and Traffic: Provide firestop systems that support floor loads involved, either by installing floor plates or by other means.
8. Surface-Burning Characteristics: Provide firestopping having a maximum FSI Value of 0 and a maximum SDI Value of 0 (Class A), when tested in conformance with ASTM E 84.

2.3 MATERIALS

A. Latex Sealant: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

B. Silicone Sealant: Single-component, silicone-based, neutral-curing elastomeric sealants. Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces; non-sag formulation for openings in walls and other vertical and overhead surfaces.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

D. Intumescent Putty: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Intumescent Blocks: Intumescent flexible block based on a two-component polyurethane foam

G. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

H. Pillows and Bags: Reusable heat-expanding pillows and bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

I. Pre-formed Mineral Wool: Designed to fit flutes of metal decking and the gap between the top of wall and metal decking as a backer for spray material.

J. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors, consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket, including similar devices.

K. Pre-Installed Firestop Devices: Factory-assembled devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and cable bundles penetrating concrete floors or gypsum board walls.

L. Metal Track Firestopping:
   1. Description: Top- and bottom-of-wall metal tracks to fills gaps between the metal and concrete surfaces and help seal out fire and smoke sound drafts.
   2. Product: “Firestop Top Track Seal CFS-TTS” manufactured by Hilti, or equal.

M. Fire Rated Cable Pathways:
   1. Description: Gangable device modules consisting of steel raceways with intumescent foam pads requiring no additional action to achieve fire and leakage ratings, including plugs, twisting closure, putty, pillow, or sealant.
   2. Products: “EZ-PATH Series 44+ Fire Rated Pathway” manufactured by Specified Technologies, Inc., or equal.
   3. Requisite Properties:
      a. Size: 4 inches wide by 4-5/8 inches high by 14 inches long.
      b. Material: 0.059-inch BMT (MSG 18) galvanized steel sheet.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Open firestopping containers only as required for use and mix only in designated areas.

B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

C. Do not reduce, alter, or introduce foreign materials into firestopping, except in conformance with manufacturer’s instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify substrates are dry and free of deleterious and other substances that might interfere with firestopping adhesion, appearance, or performance.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and firestopping installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install firestopping using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install firestopping under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Fireproofing surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.

5. Completed work must match approved samples and mockups, as accepted by the Architect.
6. Installed firestopping must be warrantable. Do not install, correct, or replace firestopping in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Prime substrates as required, recommended, approved, or accepted by the manufacturer, using the manufacturer's recommended products and methods.
   a. Confine primers to bond areas.
   b. Do not allow spillage and migration onto exposed surfaces
2. Install forming, damming, and backing materials and other accessories as required to support fill materials during installation in the positions needed to produce cross-sectional shapes and depths required for indicated fire ratings.
3. Verify wet film thickness of firestopping during application by taking numerous measurements with a wet film gage.
4. After installing fill materials and allowing them to fully cure, remove forming materials and other accessories not indicated as permanent components of the firestopping systems.
   a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required achieving fire-resistance ratings indicated.
   b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   c. Where fill materials remain exposed after installation, produce uniform finished surfaces without substrates, undercoats, marks, or stains showing through. Produce sharp and even lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Site Inspections:
1. General: Include site inspections as part of the work of this specification section. The Owner’s testing and inspection agency performs inspections.
   a. Schedule and arrange all inspections.
   b. Coordinate all work and the final construction schedule with all inspections.
   c. Coordinate inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.

d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
e. Arrange inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
f. Witness all site inspections.
g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.

2. Required Inspections: Inspections are performed in conformance with the requirements of ASTM E 2174 (through penetration fire stops) and ASTM E 2393 (fire resistive joint systems and perimeter fire barriers).

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

A. Protect installed firestopping in place from deterioration and damage until covering firestopping or Substantial Completion.

B. Do not store anything adjacent to or against installed firestopping unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed firestopping surfaces as work surfaces.

C. Remove protection when it's no longer needed and before covering firestopping or Substantial Completion.

END OF SECTION

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SECTION 07 9200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Traffic sealants.
   2. Exterior façade sealants.
   3. Interior joint sealants.
   4. Joint sealant backings.
   5. Surface preparation.
   6. Site tests and inspections.
   7. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 81 33 for acoustical sealants.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the sealant manufacturer, unless otherwise indicated.
   2. Ultra-Low Modulus: Means having a joint movement extension/compression capability of at least a 100-percent increase and at least a 50-percent decrease, when tested in conformance with ASTM C 719.
   3. Low Modulus: Means having a joint movement extension/compression capability of at least a 50-percent increase and at least a 50-percent decrease, when tested in conformance with ASTM C 719.
   4. Medium Modulus: Means having a joint movement extension/compression capability of at least a 35-percent increase and at least a 35-percent decrease, when tested in conformance with ASTM C 719.

5. High Modulus: Means having a joint movement extension/compression capability of at least a 25-percent increase and at least a 25-percent decrease, when tested in conformance with ASTM C 719.
6. Very High Modulus: Means having a joint movement extension/compression capability of at least a 12.5-percent increase and at least a 12.5-percent decrease, when tested in conformance with ASTM C 719.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified sealants are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

B. Performance Requirements:
   1. Joint sealants must establish and maintain a continuous watertight seal without staining substrates or deterioration.
   2. Sealants installed in contact with porous substrates must demonstrate testing in conformance with ASTM C 1248 resulting in no staining to porous materials identical to those indicated for this project.

C. Preinstallation Meeting:
   1. Hold a meeting after preliminary preparation of specified submittals and before issuing submittals to the Architect for review and approval.
      a. Sealant manufacturer’s representative and distributer must attend meeting.
      b. Sealant installer and the same installer’s personnel designated to perform the work of this specification section must attend meeting.
      c. Architect and waterproofing consultant must attend meeting.
   2. During the meeting, review the Contract Documents, preliminary submittals, in-service project conditions, and installation sequence and methods, including special details and conditions that might affect installation.
      a. Review, discuss, and schedule preconstruction testing to determine chemical and adhesive combability of all materials, joint substrates, shims, setting blocks, joint sealant backings, secondary seals, and other materials that will contact or affect joint sealants. Obtain joint-sealant manufacturer’s instructions for corrective measures for items failing tests.
      b. Review and discuss sealant backings, including backing types, materials, configurations, sizes, installed depths relative to joint widths, and other criteria.

c. Review and discuss substrate preparation, including whether priming and other specific joint preparation techniques are necessary or required to obtain optimum adhesion of joint sealants to joint substrates.
d. Review and discuss sealant mixing, installation, and tooling, including joint configurations relative to ASTM C 1193 and those indicated on the Drawings.
e. Review and discuss field testing, including both non-destructive and destructive testing procedures, subsequent evaluation and corrective measures for items failing tests, and repair of damaged sealants.

3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed sealants. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not make submittal to the Architect for review and approval until disagreements are successfully resolved to the satisfaction of all parties.

D. Scheduling: Schedule cleaning to prevent dust and other contaminants from falling on freshly-applied sealants.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Samples: Submit at least 6-inch long representative samples of each sealant variety in each selected color.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished joint sealants.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Joint sealants must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing sealants installed on previous projects similar to this project in size, material, design, and complexity.
2. Installer: Company or individuals must have experience installing joint sealants for previous projects similar to this project in size, material, design, and complexity. Installers and supervisors must be

3. Supervisors: Individuals must have experience installing joint sealants for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading joint sealant installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective sealant materials with undamaged new sealants materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install joint sealants only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

1. Do not install joint sealants during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
3. Do not apply joint sealants when
   a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
   b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
   c. surface temperatures are 5 deg. F or less above the dew point.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving joint sealants must be dry. Install joint sealants only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
2. Illumination: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

C. Other Conditions: Do not apply sealants where dust is generated, or liquids are sprayed.

1.8 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years (urethane sealants) and 20 years (silicone sealants).

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Silicone Sealant Manufacturers: Provide products manufactured by one of the following, or equal. Private label and third-party-manufactured sealants are prohibited.
   1. Dow Corning Corp.
   2. Momentive Performance Materials, Inc.

B. Polyurethane Sealant Manufacturers: Provide products manufactured by one of the following, or equal.
   1. BASF Building Systems.
   2. Pecora Corp.
   3. Sika Corp.

C. Acrylic Latex Sealant Manufacturers:
   1. LATICRETE International, Inc.
   2. Pecora Corp.
   3. Tremco, Inc.

2.2 TRAFFIC JOINT SEALANTS

A. Self-Leveling Polyurethane Traffic Sealant:
   1. Application: Used to weather seal interior and exterior flat walkways, plazas, decks, parking garages, and similar horizontal installation joints subject to pedestrian or vehicular traffic.
   2. Description: Single-component polyurethane sealant conforming to ASTM C 920 requirements for Type S, Grade P, Class 25, Use T, M or O sealant, as applicable.
   3. Product: Provide one of the following, or equal.
      a. “Sonneborn Sonolastic SL 1” manufactured by BASF Building Systems.
      b. “Urexpan NR-201” manufactured by Pecora Corp.
      c. “Sikaflex-1c SL” manufactured by Sika Corp.
   4. Colors: Selected by the Architect from the manufacturer’s standard colors.

B. Non-Sag Polyurethane Traffic Sealant:
   1. Application: Used to weather seal interior and exterior sloped walkways, plazas, decks, parking garages, and similar sloped installation joints subject to pedestrian or vehicular traffic.
   2. Description: 2-component polyurethane sealant conforming to ASTM C 920 requirements for Type M, Grade NS, Class 25, Use T, NT, M, G, A, O, or I sealant, as applicable.

3. Product: “Sikaflex-2c NS” manufactured by Sika Corp., or equal.
4. Colors: Match adjacent surface.

2.3 EXTERIOR FACADE SEALANTS

A. Ultra-Low Modulus Silicone Sealant:
   1. Description: Neutral-curing silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 100/50, Use NT, A or O sealant, as applicable.
   2. Application: Used for sealing expansion and control joints, precast concrete panel joints, EIFS joints, curtainwall joints, mullion joints, stone pavers, and other exterior building joints subject to extreme or dynamic movement.
   3. Products: Provide one of the following, or equal.
      a. “DOWSIL 790” manufactured by Dow Corning Corp.
      b. “GE SCS 2700 SilPruf LM” manufactured by Momentive Performance Materials, Inc.
   4. Colors: Selected by the Architect from the manufacturer’s standard colors.

B. Low Modulus Silicone Sealant:
   1. Description: Neutral-curing silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 50, Use NT, M, G, A or O sealant, as applicable.
   2. Application: Used for weatherproofing building facade materials, including glass, aluminum, steel, painted metal, EIFS, granite and other stone, concrete, brick and plastics.
   3. Products: Provide one of the following, or equal.
      a. “DOWSIL 795” manufactured by Dow Corning Corp.
      b. “GE SCS 2000 SilPruf LM” manufactured by Momentive Performance Materials, Inc.
   4. Colors: Selected by the Architect from the manufacturer’s standard colors.

C. Butyl Sealant:
   1. Description: Single-component, solvent-release plasticized polyisobutylene (butyl rubber) conforming to ASTM C 1311.
   2. Application: Applied to weather seal joints between sheet metal flashings and substrates.
   3. Color: Black.

2.4 SPECIALTY JOINT SEALANTS

A. Low Modulus Porous Surface Sealant:

1. Description: Neutral-curing silicone sealant conforming to ASTM C 920 for Type S, Grade NS, Class 50, Use NT, M, G, A or O sealant, as applicable.
2. Application: Used for weatherproofing exterior building joints in sensitive porous stone requiring reduced substrate staining; and with metal panel substrates requiring reduced residue rundown.
3. Products: Provide one of the following, or equal.
   a. “756 SMS” manufactured by Dow Corning Corp.
   b. “GE SCS 9000 SilPruf NB” manufactured by Momentive Performance Materials, Inc.
4. Colors: Selected by the Architect from the manufacturer’s standard colors.

2.5 INTERIOR JOINT SEALANTS

A. Single-Component Damp Location Sealant:

1. Description: Medium or high modulus mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
2. Products: Provide one of the following, or equal.
   a. “786” manufactured by Dow Corning Corp.
   b. “Sanitary SCS 1700” manufactured by Momentive Performance Materials, Inc.
3. Colors: White or clear, as selected by the Architect.

B. General Purpose Interior Sealant:

1. Description: Siliconized acrylic-latex sealant conforming to ASTM C 834 requirements for Type OP, Grade NF classification, as required.
2. Products: Provide one of the following, or equal.
   a. “Sonneborn Sonolac” manufactured by BASF Building Systems.
   b. “AC-20+Silicone” manufactured by Pecora Corp.
   c. “Tremflex 834” manufactured by Tremco, Inc.
3. Colors: Selected by the Architect from the manufacturer’s standard colors.

2.6 JOINT SEALANT BACKINGS

A. Closed Cell Foam Joint Backing:

1. Description: Extruded polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type C.
2. Application: Provide closed-cell backer rod at all exterior applications unless otherwise indicated on the Drawings.
3. Products: Provide one of the following, or equal.
   a. “Mile High Foam” manufactured by Backer Rod Mfg. Inc.
   b. “HBR” or “Green Rod” manufactured by Nomaco, Inc.
   c. “NuFlex 870” manufactured by TVM Building Products.
4. Performance Requirements:
   a. Maximum Water Absorption: Not more than 0.10 grams per cubic centiliter when tested in conformance with conformance with ASTM C 1016, Procedure B.
   b. Minimum Density: At least 24 per cubic meter when tested in conformance with conformance with ASTM D 1622.
   c. Maximum Outgassing: Less than 1 bubble when tested in conformance with conformance with ASTM D 1253.
   d. Minimum Compression Recovery: At least 90 percent, when tested in conformance with conformance with ASTM D 5249.
   e. Minimum Compression Deflection: At least 20.5 percent, when tested in conformance with conformance with ASTM D 5249.
   f. Minimum Tensile Strength: At least 200 kPa, when tested in conformance with conformance with ASTM D 1623.

B. Open Cell Foam Joint Backing:

1. Restrictions: Permitted only for interior use, and as the second (interior) line of a double-line sealant application.

C. Bi-Cellular (Dual-Cell) Foam Joint Backings:

1. Description: Extruded polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type B.
2. Restrictions: Permitted only for interior use. Only bi-cellular (dual-cell) foam may be used as a backing for single-component (air-cure) materials.
3. Products: “Sof Rod” or “Dual Rod” manufactured by Nomaco, Inc., or equal.
4. Performance Requirements:
   a. Maximum Water Absorption: Not more than 0.10 grams per cubic centiliter when tested in conformance with conformance with ASTM C 1016, Procedure B.
   b. Density: At least 24 kilograms per cubic meter when tested in conformance with conformance with ASTM D 1622.

c. Maximum Outgassing: Less than 1 bubble when tested in conformance with conformance with ASTM D 1253.
d. Minimum Compression Recovery: At least 90 percent, when tested in conformance with conformance with ASTM D 5249.
e. Minimum Compression Deflection: At least 20.5 percent, when tested in conformance with conformance with ASTM D 5249.
f. Minimum Tensile Strength: At least 200 kPa, when tested in conformance with conformance with ASTM D 1623.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

E. Prefabricated Backer Seal: “BackerSeal” manufactured by Emseal Joint Systems, Ltd., or equal.

2.7 TAPE SEALANTS

A. Foam Tape:
1. Description: Closed-cell, compressible PVC foam with pressure-sensitive adhesive.
2. Product: “NORSEAL” foam tape manufactured by Saint-Gobain Performance Plastics, or equal.

B. Pre-Formed Silicone Sheet:
1. Applications: Used at barrier transitions to rough openings.
2. Product: “Dow Corning 123 Silicone Seal” manufactured by Dow Corning Corp., or equal.
3. Colors: Selected by the Architect from the manufacturer’s standard colors.

2.8 ACCESSORIES

A. Primer and Surface Cleaners:
1. Application: Applied to enhance and strengthen sealant adhesion to porous and nonporous substrates; and help ensure proper joint preparation
2. Porous and Cementitious Surfaces: “1200 OS Primer” manufactured by Dow Corning Corp., or equal.
3. Other Surfaces: “Construction Primer P” manufactured by Dow Corning Corp., or equal.

B. Masking Tape: Provide paper masking tape manufactured by 3M, or equal, unless another kind is supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.9 MIXING

A. Open sealants containers only as required for use and mix only in designated areas.

B. Do not reduce, alter, or introduce foreign materials into sealants, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify joint dimensions and joint backer sizes conform to width-to-depth ratios, neck dimensions, and surface bond areas required, recommended, or accepted by the manufacturer.
3. Verify substrates are dry and free of deleterious and other substances that might interfere with joint sealant adhesion, appearance, or performance.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and joint sealant installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation:

1. Prepare substrates in conformance with ASTM C 1193 and as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.
2. Remove loose materials and foreign matter that may impair sealant adhesion.
3. Clean and prime substrates as required, recommended, or accepted by the manufacturer, using the manufacturer's recommended products and methods.
   a. Confine primers to bond areas.
   b. Do not allow spillage and migration onto exposed surfaces

3.3 INSTALLATION

A. General Requirements:

1. Install joint sealants in conformance with ASTM C 1193 using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install joint sealants under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Joint sealant surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work. Produce sharp and even lines and color breaks.
4. Completed work must match approved samples and mockups, as accepted by the Architect.
5. Installed joint sealants must be warrantable. Do not install, correct, or replace joint sealants in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Install sealant backings to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   a. Install sealants free of air pockets, foreign embedded matter, ridges, and sags.
   b. Do not leave gaps between ends of sealant backings.
   c. Do not stretch, twist, puncture, or tear sealant backings.
   d. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

2. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
3. Size materials to achieve required width/depth ratio.
4. Install sealants using proven techniques that conform to the following and at the same time backings are installed:
    a. Place sealants so they directly contact and fully wet joint substrates.
    b. Completely fill recesses in each joint configuration.
    c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
    d. Employ installation techniques that ensure joint sealers are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of bond surfaces equally on opposite sides.
    e. Joint configuration: Fill sealant joint to a slightly concave surface, slightly below adjoining surfaces, unless otherwise indicated.
    f. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture or dirt.
5. Promptly after sealant application, and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
    a. Remove excess sealant from surfaces adjacent to joints.
    b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
    c. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
    d. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
    e. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
6. Preformed Silicone-Sealant System:
    a. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
    b. Apply silicone sealant to each side of joint to produce a bead of size conforming to the preformed silicone-sealant system manufacturer's instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.

c. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
d. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

7. Preformed Foam Sealant Special Techniques:
   a. Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material.
   b. Produce seal continuity at ends, turns, and intersections of joints.
   c. For applications at low ambient temperatures, apply heat to sealant in conformance with sealant manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:
   1. General: Include site inspections as part of the work of this specification section. The Owner's testing and inspection agency performs inspections.
      a. Schedule and arrange all inspections.
      b. Coordinate all work and the final construction schedule with all inspections.
      c. Coordinate inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
      d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
      e. Arrange inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
      f. Witness all site inspections.
      g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
      h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
   2. Porous Substrate Stain Testing: Procedures must conform to ASTM C 510.

3. Non-Destructive Spot Testing: Procedures must conform to ASTM C 1521.
    a. The center of sealant beads is depressed with a blunt dowel-shaped probing tool to depth of 50 percent of the bead width.
    b. If sealant fails, then the failure is recorded along with whether the failure was an adhesive or cohesive failure, and the maximum surface depression as a percentage of joint width.
    c. Tests are performed every 12 inches for first 10 linear feet of each joint; if test failure is not observed, then tests are performed every 24 inches thereafter.
4. Non-Destructive Continuous Inspection: Procedures must conform to ASTM C 1521.
    a. Certain sealant quantities, locations, and lengths up to100-percent inspection of an entire assembly sealant may be chosen by the Architect for general sealant assessment, including joint configurations known to be difficult to install, changes in sealant and substrate types, or other quantities and locations.
5. Destructive Testing: Procedures must conform to ASTM C 1521.
    a. A 3-inch-long tab is cut into the sealant bead.
    b. The tab is marked one inch from the beginning of the adhesive bond away from the cut tail.
    c. The tab is grasped one inch from the beginning of the adhesive bond and pulled until it extends to 2 times the published movement capability of the sealant. If sealant does not fail, it is then pulled to failure.
    d. Elongation at the point of failure is recorded along with whether the failure was an adhesive or cohesive failure.
    e. Sealant is then observed during the complete filling of the joint for the presence of voids, for joint configuration, and for conformance with specified requirements. Observations and sealant dimensions are recorded.
    f. 10 tests are performed for the first 1,000 linear feet of joint for each type of sealant and substrate; if failure at two times the movement capability is not observed, then one test is performed for either every 1,000 linear feet thereafter or at a rate of one test per floor per building elevation, whichever is more frequent.
6. After testing is complete, promptly replace failed sealants in test areas.
    a. Neatly cut out and remove failed sealant, prepare and prime surfaces, and install new sealant.
    b. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Cleaning Work: Clean sealant from adjacent surfaces.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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DIVISION 08

OPENINGS

SECTION 08 1213
STANDARD HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standard hollow metal door frames.
   2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 08 71 00 for door hardware.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. BMT: Base Metal Thickness.
   2. DHI: Door Hardware Institute.
   3. HM: Hollow Metal.
   4. MSG: Manufacturer's Standard Gage.
   5. DI: Steel Door Institute.

B. Definitions:
   1. Manufacturer: Means the door frame manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate building opening tolerances with door frame manufacturing and erection tolerances.
   2. Coordinate hardware preparations, handing, and reinforcement requirements and locations with the Drawings, door schedule, and selected hardware sets.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standard Requirements:

1. Manufacturing Tolerances: Comply with the requirements of ANSI/SDI publication ANSI/SDI A250.8, "*Recommended Specifications for Standard Steel Doors and Frames"*.
2. Door Frame Installation Standards:
   a. Install fire-resistance rated frames in conformance with NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*".
   b. Install other frames in conformance with of ANSI A250.11, "*Recommended Erection Instructions for Steel Frames*".
3. Hardware Preparations and Reinforcement: Comply with the requirements of ANSI/SDI A250.6, "*Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*" with reinforcing plates fabricated from the same material as door face sheets.
4. Door Hardware Installation Standards: Install door frame hardware in conformance with ANSI/DHI A115-IG, "*Installation Guide for Doors and Hardware*".

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing door frames installed on previous projects similar to this project in size, material, design, and complexity. Manufacturer must be a current member of SDI.
2. Installer: Company or individuals must have experience installing door frames for previous projects similar to this project in size, material, design, and complexity. Installer must be a current member of SDI.
3. Supervisors: Individuals must have experience installing door frames for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading door frame installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Unload and store only inspected and accepted items.
3. Across the bottom of welded frames, at least 2 removable spreader bars must be tack welded to jambs and mullions.
4. Frames must be palletized, wrapped, or crated to provide protection during transit and site storage.

B. Storage: Store unloaded items as shipped, upright, and indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. Allegion PLC.
2. ASSA ABLOY.
3. Door Components, Inc.
4. MPI Custom Steel Doors and Frames.
5. Republic Doors and Frames.

2.2 STANDARD HOLLOW METAL FRAMES

A. Description: 3-sided (open), fully welded masonry (universal) and flush drywall standard HM frames conforming to the requirements of Steel Door Institute publication SDI-100, “*Recommended Specifications for Standard Steel Doors and Frames”*.

B. Products: “Steelcraft” frames manufactured by Allegion, or equal.
1. Single Egress Door HM Frames: “F-Series” frames, or equal.
2. Double Egress Door HM Frames: “FE-Series” frames, or equal.
3. Cross-Corridor Door HM Frames: “DE-Series” frames, or equal.
4. Stainless Steel HM Frames: “FS-Series” frames, or equal.

2.3 COMPONENTS

A. Materials:

1. Frames with an Uncoated Finish (Bare or Natural Finish): Fabricate from zinc coated (HDG) steel sheet or from stainless steel sheet, as indicated.
2. Exterior Frames with a Painted Finish and Interior Frames Installed in Wet or High Humidity Locations (including shower rooms and toilet rooms): May be fabricated from either zinc-iron alloy coated (galvannealed) steel sheet or stainless steel sheet.
3. Interior Frames Installed Elsewhere: Fabricate from uncoated CRS sheet.
4. Sidelight and Transom Frames: Fabricate from the same material, thickness, and finish as the adjacent door frame.

B. Material Thickness:

1. HM Frames for Level 1 and Physical Performance Level C (Standard Duty) Doors: Fabricate from at least 0.0478-inch BMT (MSG 18) uncoated and zinc-coated steel sheet; or from at least 0.0500-inch (USSG 18) stainless steel sheet.
2. HM Frames for Level 2 (Heavy Duty) and Physical Performance Level B, and for Level 3 and Physical Performance Level B (Extra Heavy Duty) Doors: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.
3. HM Frames for Level 3 and Physical Performance Level B (Extra Heavy Duty) Doors: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.
4. HM Frames for Level 4 and Physical Performance Level A (Maximum Duty) Doors: Fabricate from at least 0.0747-inch BMT (MSG 14) uncoated and zinc-coated steel sheet, or at least 0.0781-inch (USSG 14) stainless steel sheet.
5. Other HM Frames: Fabricate from at least 0.0598-inch BMT (MSG 16) uncoated steel and zinc-coated steel BMT; or from at least 0.0625-inch BMT (USSG 16) stainless steel sheet.

C. Profiles:

1. Types: Indicated on the Drawings.
2. Throat Openings:
   a. Butted Frames: Equal to the wall or partition type thickness minus twice the frame return dimension, unless otherwise indicated.
   b. Wrap-Around Frames: Equal to the wall or partition thickness, unless otherwise indicated.

3. Frame Depth:
    a. Butted Frames: Equal to the wall or partition thickness.
    b. Wrap-Around Frames: Equal to the throat opening plus twice the frame return dimension.
4. Frame Return Dimension: 1/2-inch.
5. Backbend Dimension (Second, Double, or Drywall Return Dimension): At least 3/8-inch.
6. Backbend Type: Indicated on the Drawings.
7. Face Dimension: Provide 4-inch face dimension at heads in CMU construction where required to maintain a masonry module; provide 2-inch face dimension at jambs. Provide 2-inch face dimension elsewhere, unless otherwise indicated.
8. Stop Dimension: 5/8-inch.
9. Rabbet Depth Dimension: Equal to 3/16-inch greater than the door thickness.
10. Opposite Door Rabbet Depth Dimension: 1-9/16 inches.
11. Soffit Dimension: Equal to the frame depth minus the sum of the rabbet dimensions.

D. Corners:
1. Welded HM Door Frames: Provide square-cut mitered or coped and mitered, set-up arc welded (SUA) and ground smooth, full profile welded frames (fully welded or continuously welded frames) for installation of frames as a complete unit. All corners must be watertight.
2. HM Frame Glazing Beads: Provide butted corners.

E. Hardware Preparations and Reinforcement: Provide HM frame hardware reinforcing and preparations in conformance with ANSI/SDI publications A250.6, "*Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames"* and A250.8, "*Recommended Specifications for Standard Steel Doors and Frames"*.

2.4 ACCESSORIES

A. Head Reinforcement: For opening widths greater than 48 inches wide, provide channel or angle stiffeners fabricated from at least 0.0747-inch BMT (MSG 14) zinc coated (HDG) steel sheet or at least 0.0781-inch BMT (USSG 14) stainless steel sheet, as applicable.

B. Anchors:

1. Masonry Anchors: Provide either 3/16-inch minimum diameter (SWG 7) galvanized carbon steel masonry wire anchors or at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet masonry tee anchors, as applicable.
2. Existing Opening Anchors: Provide at least 16-gage welded pipe sleeve anchors with 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet straps designed specifically to add support for bolting frames into rough openings of an existing walls.
3. Wood Stud Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet anchors designed specifically for attachment to the wood studs of a rough opening.
4. Metal Stud Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet anchors designed specifically for attachment to the webbing of the closed steel studs built around the frame.
5. Universal Stud Wall Anchors: Provide either at least 0.0598-inch BMT (MSG 16) zinc coated (HDG) steel sheet universal lock-in jamb anchors designed specifically for use in either wood or steel stud wall applications, as applicable.
6. Base Anchors: Provide either at least 0.0598-inch (MSG 16) BMT zinc coated (HDG) steel sheet or at least 0.0625-inch BMT (USSG 16) stainless steel sheet base anchors, as applicable. Provide adjustable base anchors that allow for installation adjustment when the floor is not level.

C. Electrical Device Requirements: Make provisions for installation of electrified hardware and door electrical devices, and arrange so that wiring is readily installed, removed, and replaced.

1. Provide cutouts and reinforcement required for installation of devices.
2. Provide metal conduits or raceways to accommodate wiring between devices. (e.g., from electric hinge to other electric door hardware)

D. Glazing Stops:

1. Fire-Rated Conditions: Provide 3/4-inch square channel glazing beads.
2. Elsewhere: Provide 5/8-inch square channel glazing beads.
3. Material Thickness: Fabricate from at least 0.0478-inch BMT (MSG 18) uncoated and zinc-coated steel sheet.

E. Silencers: Provide loose, 1/8-inch thick by 1/2-inch wide pressure-sensitive-adhesive-backed polychloroprene (Neoprene) or ethylene propylene diene monomer (EPDM) rubber silencers for field installation. Furnish at least 3 for each strike jamb and at least 2 for double door head. Do not provide silencers where they may interfere with other seals, including smoke & draft seals.

F. Filler: Provide material conforming to the requirements of ANSI/SDI publication A250.8, "*Recommended Specifications for Standard Steel Doors and Frames"*. Use UL-listed materials in frames scheduled as having a fire-resistance rating.

G. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MATERIALS

A. Uncoated Carbon Steel Sheet:

1. Frame Material: Finished CRS coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), exposed, temper rolled, regular matte surface finish (40 to 59 AA), and oiled (sheet must be thoroughly cleaned to remove the oil prior to painting).
2. Hardware Reinforcements: HRS coil, sheet, and strip conforming to ASTM A 1011, CS Type B (commercial steel), as-rolled surface finish, with cut edges.

B. Zinc-Iron Alloy Coated (Galvannealed) Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface.

1. Coating Weight (Mass) Designation: Provide at least a A60 (galvannealed) minimum coating weight (mass) designation.
2. Surface Finish: Non-spangled matte finish.
3. Surface Treatment: Provide mill phosphate surface treatment (paint-grip finish - provides enhanced lubricating characteristics).

C. Zinc Coated (HDG) Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface.

1. Coating Weight (Mass) Designation: Provide at least a G90 (galvanized) minimum coating weight (mass) designation.
2. Surface Finish: Provide regular spangle surface finish.
3. Surface Treatment:
   a. Exterior Frames: Provide oil over chemical surface treatment (chemical treatment desired for humid-storage stain resistance and oil treatment needed for enhanced formability).
   b. Interior Frames: Provide oiled surface treatment (needed for enhanced formability).

2.6 FINISHES

A. Uncoated Steel HM Frames: Provide shop-applied phosphate (paint-grip) pre-treatment and baked on rust inhibitive primer. Primer must be compatible with either field-applied paint or field-applied coating systems specified in Division 09, as applicable.

B. Zinc Coated and Zinc-Iron Alloy Coated Steel and Stainless Steel HM Frames: Provide shop-applied bonderized pre-treatment. (not prime painted)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install door frames in conformance with the quality standards publications using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed door frames must be warrantable. Do not install, correct, or replace door frames in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Install frames with removable glazing stops located on secure side of opening.

b. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
c. Install door silencers in frames before grouting.
d. Provide setting spreaders, supplied by the installer, and leave intact until frames are set square and plumb within specified tolerances, and all anchors are securely attached and grouted where required.
e. Remove frame spreader bars only after frames re properly set and secured. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
5. Ceiling Struts: Except where anchored to masonry or to other structural support at each jamb, extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame.
   a. Bend top of struts to provide flush contact for securing to supporting construction.
   b. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Glazing: Comply with installation requirements in Section 08 81 00 and with the manufacturer's instructions. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches O.C. and not more than 2 inches on center from each corner.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach door frames to supporting construction.

D. Installation Tolerances: Install frames within the following tolerance variations.
1. Maximum Out of Square: Not more than 1/16-inch, measured at rabbet on 90 degrees from jamb perpendicular to frame head.
2. Maximum Out of Alignment: Not more than 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Maximum Twist: Not more than 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Maximum Out of Plumb: Not more than 1/16-inch, measured on floor at jambs.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible door frame surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed door frames in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed door frames unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed door frames as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 1313
STANDARD HOLLOW METAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standard hollow metal doors.
   2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 08 71 00 for door hardware.
   2. Section 08 81 00 for safety-rated glass.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. BMT: Base Metal Thickness.
   2. DHI: Door Hardware Institute.
   3. HM: Hollow Metal.
   4. MSG: Manufacturer's Standard Gage.
   5. SDI: Steel Door Institute.

B. Definitions:
   1. Manufacturer: Means the door manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate building opening tolerances with door manufacturing and erection tolerances.
   2. Coordinate hardware preparations, handing, and reinforcement requirements and locations with the Drawings, door schedule, and selected hardware sets.
   3. Coordinate door hardware finishes with other door hardware finishes.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Door Schedule: Submit schedule showing opening identification symbols and door and frame types and sizes, including thickness, swing, fire-resistance rating label requirements, undercuts, and finishes. Use the same reference numbers for openings and details as the Drawings.
3. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to door schedule.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished doors.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Doors must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Fire-Protection Rating: Within fire-resistance rated assemblies, provide fire-protection-rated doors conforming to NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 252, "*Standard Methods of Fire Tests of Door Assemblies*" and UL 10B, "*Standard for Fire Tests of Door Assemblies*"**;** or UL 10C, "*Standard for Positive Pressure Fire Tests of Door Assemblies*" for doors at atmospheric (neutral) pressure. A label or listing mark indicating the fire-protection rating must be permanently affixed at the factory in a location such that the label remains visible after the door is installed and must include UL "S" and "Positive Pressure Test" listings.

2. Temperature Rise Rating: At vertical exit enclosures and exit passageways, provide doors with a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

3. Smoke-Control Door Assemblies: Provide doors conforming to the requirements of with NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 105, "*Standard for Smoke Door Assemblies and Other Opening Protectives*" or UL 1784, "*Standard for Air Leakage Tests of Door Assemblies*".

C. Quality Standard Requirements:

1. Manufacturing Tolerances: Comply with the requirements of ANSI/SDI publication ANSI/SDI A250.8, "*Recommended Specifications for Standard Steel Doors and Frames"*.

2. Hardware Preparations and Reinforcement: Comply with the requirements of ANSI/SDI A250.6, "*Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*" with reinforcing plates fabricated from the same material as door face sheets.

3. Door Hardware Installation Standards: Install door hardware in conformance with ANSI/DHI A115-IG, "*Installation Guide for Doors and Hardware*".

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing doors installed on previous projects similar to this project in size, material, design, and complexity. Manufacturer must be a current member of SDI.

2. Installer: Company or individuals must have experience installing doors for previous projects similar to this project in size, material, design, and complexity. Installer must be a current member of SDI.
3. Supervisors: Individuals must have experience installing doors for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading door installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items as shipped, upright, and indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.
C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Allegion PLC.
   2. ASSA ABLOY.
   3. Door Components, Inc.
   4. MPI Custom Steel Doors and Frames.
   5. Republic Doors and Frames.

2.2 STANDARD HOLLOW METAL DOORS

A. Description: Commercial full flush and seamless steel-stiffened doors.
B. Products: “Steelcraft” doors manufactured by Allegion, or equal.
   1. Standard Duty Doors: “SL20” doors, or equal.

2. Heavy Duty Doors: “BW18” doors, or equal.
3. Extra Heavy Duty Doors: “BW16” doors, or equal.
4. Maximum Duty Doors: “BW14” doors, or equal.
5. Temperature Rise Rated Doors: “T-14” doors, or equal.

C. Requisite Properties:
1. Construction: Provide the following, conforming to SDI 108.
   a. Main Entrance and Exit Doors: Level 4 (maximum-duty), Model 2 (seamless with welded edge construction).
   b. Toilet Room Doors: Level 3 (extra heavy-duty), Model 2 (seamless with welded edge construction).
   c. Mechanical, Storage, and Utility Doors: Level 3 (extra heavy-duty), Model 2 (seamless with welded edge construction).
   d. Patient Room Doors: Level 3 (extra heavy-duty), Model 2 (seamless with welded edge construction).
2. Types: SDI 106, Type F (flush), Type G (half glass), Type V (vision light), Type FG (full glass), Type N (narrow light), Type L (louvered), as indicated on the Drawings. Thickness: 1-3/4 inches.
3. Face Sheets:
   a. Exterior Doors: Fabricate from at least 0.0747-inch BMT (MSG 14) galvannealed steel sheet. (maximum duty)
   b. Interior Doors at Wet Locations, including Shower and Toilet Rooms: Fabricate from at least 0.0747-inch BMT (MSG 14) galvannealed steel sheet. (maximum duty)
   c. Interior Doors Located Elsewhere: Fabricate from at least 0.0598-inch BMT (MSG 16) CRS. (extra heavy duty)
   d. Level 1 (standard duty): 0.0359-inch BMT (MSG 20)
   e. Level 2 (heavy-duty): 0.0478-inch BMT (MSG 18)
   f. Level 3 (extra heavy-duty): 0.0598-inch BMT (MSG 16)
   g. Level 4 (maximum-duty): 0.0747-inch BMT (MSG 14)
4. Core Construction:
   a. Exterior Insulated Doors: Maximum thermal transmittance (U-factor) value of not more than 0.50 BTU per hour per square foot per deg. F, when tested in conformance with ASTM C 1363.
   b. Fire-Resistance Rated and Other Doors: Manufacturer’s standard core necessary to meet indicated fire-resistance and temperature-rise ratings.
5. Vertical Edges: Manufacturer's standard edge with mechanical edge seam welded and finished before priming.

6. Top and Bottom Edges: Close edges with flush or inverted channels or end closures fabricated from same material as face sheets, but not less than at least 0.0747-inch BMT (MSG 14). Provide screw-on caps at exterior doors.
7. Minimum Hardware Reinforcement: Fabricate reinforcing from the same material as door in conformance with the following. Reinforcement must be offset to allow faces of mortised hardware devices to be installed flush with door surfaces.
    a. Hinges: At least 0.1094-inch BMT (MSG 12) continuous stile extruded and tapped to at least 0.1875-inch BMT (MSG 07) reinforcement, unless another thickness and size are required by the by the hardware manufacturer based on actual in-service conditions applicable to the project.
    b. Lock Front, Strike, and Flushbolt Reinforcement: At least 0.1094-inch BMT (MSG 12) by sizes required by the hardware manufacturer, unless another thickness is required by the by the hardware manufacturer based on actual in-service conditions applicable to the project.
    c. Lock Reinforcement: At least 0.0625-inch BMT (MSG 16) by size as required by lock manufacturer, unless another thickness is required by the by the hardware manufacturer based on actual in-service conditions applicable to the project.
    d. Closer Reinforcement: At least 0.0625-inch BMT (MSG 16) one-piece channel by size as required by the closer manufacturer, unless another thickness is required by the by the hardware manufacturer based on actual in-service conditions applicable to the project.
    e. Exit Device Reinforcement: 0.0781-inch BMT (MSG 14) by 18 inches high by 3-3/16 inches wide, unless another thickness and size are required by the by the hardware manufacturer based on actual in-service conditions applicable to the project.
    f. Other Hardware Reinforcement: Supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
    g. Hardware manufacturers' recommended reinforcement units may be used in lieu of specified reinforcement.
8. Electrical Device Requirements: Make provisions for installation of electrified hardware and door electrical devices, and arrange so that wiring is readily installed, removed, and replaced.
    a. Provide cutouts and reinforcement required for installation of devices.
    b. Provide metal conduits or raceways to accommodate wiring between devices. (e.g., from electric hinge to other electric door hardware)

2.3 ACCESSORIES

A. Filler: Material conforming to the requirements of SDI publication SDI 100, "*Specifications for Standard Steel Doors and Frames*". Use UL-listed materials in doors scheduled to have a fire-resistance rating.

B. Vision Lights: "Vision Lite Kits" manufactured by TRUDOOR, LLC, or equal.

1. Frames: At least at least 0.0359-inch BMT (MSG 20) uncoated steel sheet, with mitered and welded corners and countersunk mounting holes.
2. Finish: Manufacturer's standard powder coat finish.
3. Frame Color: Indicated on the Drawings.
4. Safety-Rated Glass: Fully-tempered or laminated clear glass specified in Section 08 81 00.

C. Door Louvers:

1. Products: Provide the following manufactured by USA Fire Door LLC, or equal.
   a. Standard Door Louvers: "800 Series", or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
   b. Fire-Rated Door Louvers: "1900 Series", or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
2. Requisite Properties:
   a. Blades: Inverted Y or Z blades.
   b. Minimum Free Area: Between 40 and 50 percent.
   c. Finish: Manufacturer's standard powder coat finish; custom colors selected by the Architect.

D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 MATERIALS

A. Uncoated Carbon Steel Sheet:

1. Door Material: Finished CRS coil, sheet, and strip conforming to ASTM A 1008, CS Type B (commercial steel), exposed, temper rolled, regular matte surface finish (40 to 59 AA), and oiled (sheet must be thoroughly cleaned to remove the oil prior to painting).

2. Hardware Reinforcements: HRS coil, sheet, and strip conforming to ASTM A 1011, CS Type B (commercial steel), as-rolled surface finish, with cut edges.

B. Zinc-Iron Alloy Coated (Galvannealed) Steel Sheet: ASTM A 653, CS Type B (commercial steel), with equal coating weight on each surface.

1. Coating Designation: Provide at least a A60 (galvannealed) minimum coating designation.
2. Surface Finish: Non-spangled matte finish.
3. Surface Treatment: Provide mill phosphate surface treatment. (provides enhanced lubricating characteristics)

2.5 FINISHES

A. Uncoated Steel HM Frames: Provide shop-applied phosphate (paint-grip) pre-treatment and baked on rust inhibitive primer to all 6 door surfaces. Primer must be compatible with either field-applied paint or field-applied coating systems specified in Division 09, as applicable.

B. Zinc Coated and Zinc-Iron Alloy Coated Steel and Stainless Steel HM Frames: Provide shop-applied bonderized pre-treatment. (not prime painted)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install doors in conformance with the quality standards publications using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed doors must be warrantable. Do not install, correct, or replace doors in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach doors to supporting construction.

C. Installation Tolerances:

1. Fire-Rated Doors: Install doors with clearances in conforming to NFPA 80.
2. Smoke- Control Doors: Install doors with clearances in conforming to NFPA 105.
3. Other Doors: Install doors within the following clearance variations.
   a. Jambs and Head: 1/8-inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 1/4-inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/4-inch.

3.3 ADJUSTING

A. Verify smooth and quiet door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible door surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed doors in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed doors unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed doors as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood veneer-faced flush wood doors.
   2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 08 71 00 for door hardware.
   2. Section 08 81 00 for safety-rated glass.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. DHI: Door Hardware Institute.
   2. WDMA: Wood Door Manufacturers Association.

B. Definitions:
   1. Manufacturer: Means the door manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate building opening tolerances with door manufacturing and erection tolerances.
   2. Coordinate hardware preparations, handing, and reinforcement requirements and locations with the Drawings, door schedule, and selected hardware sets.
   3. Coordinate door hardware finishes with other door hardware finishes.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Door Schedule: Submit schedule showing opening identification symbols and door and frame types and sizes, including thickness, swing, fire-resistance rating label requirements, undercuts, and finishes. Use the same reference numbers for openings and details as the Drawings.
3. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to door schedule.
4. Samples: Submit at least 8-inch square representative samples of each door color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished doors.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals:

1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for door maintenance, cleaning, and repair to the Architect as a condition of project closeout.
2. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Doors must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Fire-Protection Rating: Within fire-resistance rated assemblies, provide fire-protection-rated doors conforming to NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 252, "*Standard Methods of Fire Tests of Door Assemblies*" and UL 10B, "*Standard for Fire Tests of Door Assemblies*"**;** or UL 10C, "*Standard for Positive Pressure Fire Tests of Door Assemblies*" for doors at atmospheric (neutral) pressure. A label or listing mark indicating the fire-protection rating must be permanently affixed at the factory in a location such that the label remains visible after the door is installed and must include UL "S" and "Positive Pressure Test" listings.
2. Smoke-Control Door Assemblies: Provide doors conforming to the requirements of with NFPA 80, "*Standard for Fire Doors and Other Opening Protectives*" and tested in conformance with NFPA 105, "*Standard for Smoke Door Assemblies and Other Opening Protectives*" or UL 1784, "*Standard for Air Leakage Tests of Door Assemblies*".

C. Quality Standard Requirements:

1. Product Standard: Comply with the requirements Window & Door Manufacturers Association publication ANSI/WDMA I.S.1-A, "*Industry Standard for Interior Architectural Wood Flush Doors"*.
2. Door Hardware Installation Standards: Install door hardware in conformance with ANSI/DHI A115-IG, "*Installation Guide for Doors and Hardware*".

CI. Qualifications:

1. Manufacturer: Manufacturer must be a current member of WDMA.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective doors with undamaged new doors that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Marshfield DoorSystems, Inc.
4. Oshkosh Architectural Door Co.

2.2 WOOD VENEER-FACED DOORS

A. Description: Flush wood doors conforming to WDMA I.S.1-A Performance Grade Heavy Duty.

B. Application: Transparent finish wood doors.

C. Restrictions: Doors manufactured with adhesives and composite wood products containing urea formaldehyde are prohibited.

D. Product: "Signature Series" doors manufactured by Marshfield DoorSystems, Inc., or equal.

E. Requisite Properties:

1. Type: Solid Core.
2. Grade: Premium.
3. Thickness: 1-3/4 inches.
4. Construction: 5-ply.

5. Core: Manufacturer's standard wood-based particleboard, structural composite lumber, or fire-resistant composite or mineral core, or specialty core.
6. Edge Construction: Structural composite lumber or hardwood lumber stiles and rails securely bonded to core components and machine calibrated before veneering, with edge banding veneer matching face veneer species and grade.
7. Meeting Edge: Beveled at lock stile, square edged at strike stiles.
8. Hardware Blocking: As required by hardware manufacturer to eliminate through-bolting hardware.
    a. 5-by-18-inch lock blocks at both stiles.
    b. 5-inch top rail blocking for closers and 5-inch bottom rail blocking where automatic door bottoms are indicated.
    c. 2-1/2-inch mid-rail blocking.
9. Wood Veneer: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51.
10. Transparent Finish:
    a. Grade: Premium.
    b. Surface Finish: Clear conversion varnish.
    c. Stain: Indicated on the Drawings.
    d. Sheen: Indicated on the Drawings.
11. Horizontal Surfaces: Structural composite lumber.
12. Openings: Cut and trim openings through doors in factory.
    a. Light Openings: Trim openings with materials and profiles indicated.
    b. Glazing: Field install glazing.
    c. Louvers: Factory install louvers in prepared openings.

2.3 ACCESSORIES

A. Vision Lights: "Vision Lite Kits" manufactured by TRUDOOR, LLC, or equal.
    1. Frames: At least at least 0.0359-inch BMT (MSG 20) uncoated steel sheet, with mitered and welded corners and countersunk mounting holes.
    2. Finish: Manufacturer's standard powder coat finish.
    3. Frame Color: Indicated on the Drawings or selected by the Architect.
    4. Safety-Rated Glass: Fully-tempered or laminated clear glass specified in Section 08 81 00.

B. Door Louvers:
   1. Products: Provide the following manufactured by USA Fire Door LLC, or equal.
      a. Standard Door Louvers: “800 Series”, or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
      b. Fire-Rated Door Louvers: “1900 Series”, or equal, 0.0478-inch BMT (MSG 18) uncoated steel louver door inserts.
   2. Requisite Properties:
      a. Blades: Inverted Y or Z blades.
      b. Minimum Free Area: Between 40 and 50 percent.
      c. Finish: Manufacturer’s standard powder coat finish; custom colors selected by the Architect.

C. Electrical Device Requirements: Make provisions for installation of electrified hardware and door electrical devices, and arrange so that wiring is readily installed, removed, and replaced.
   1. Provide cutouts and reinforcement required for installation of devices.
   2. Provide metal conduits or raceways to accommodate wiring between devices. (e.g., from electric hinge to other electric door hardware)

D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install doors in conformance with the quality standards publications using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed doors must be warrantable. Do not install, correct, or replace doors in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Factory-Fitted Doors: Align in frames for uniform clearance at each edge. Hang doors to operate freely for their entire travel, but not loosely, without sticking or hinge binding, with hardware adjusted and functioning properly.
2. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach doors to supporting construction.

D. Installation Tolerances:

1. Fire-Rated Doors: Install doors with clearances in conforming to NFPA 80.
2. Smoke- Control Doors: Install doors with clearances in conforming to NFPA 105.

3. Other Doors: Install doors within the following clearance variations.
    a. Jambs and Head: 1/8-inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 1/4-inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/4-inch.

3.3 ADJUSTING

A. Verify smooth and quiet door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Rehang or replace doors that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
    1. written descriptions of non-conforming, damaged, and defective work;
    2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
    3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible door surfaces in a manner that does not result in any warranty or guarantee becoming void.
    1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.

2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed doors in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed doors unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed doors as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 3116
ACCESS PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal access panel assemblies.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.

B. Definitions:

1. Manufacturer: Means the access panel manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate locations of items and equipment being accessed with access panel sizes and locations indicated on the Drawings.
2. Coordinate hardware preparations, handing, reinforcement requirements, and locations with the Drawings, access panel manufacturer, and selected hardware sets.

B. Acoustical Requirements:

1. Provide fire-rated access doors with continuous piano-style hinges at sound-rated construction.
2. Seal door flange perimeter with “S88” adhesive-backed fire and smoke gasketing manufactured by Pemko Manufacturing Co., Inc., or equal.
3. Seal entire assembly to gypsum board with acoustical sealant.
4. Include 1-1/2-inch-thick minimum insulation laminated with at least 2 pound per square foot density material such as gypsum board.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs) both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing access panel locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished access panels.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Access panels must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective access panels with undamaged new access panels that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 METAL ACCESS PANEL AND FRAMES

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Activar Construction Products Group, Inc.
   2. Acudor Products, Inc.
   3. Karp Associates, Inc.
   4. Nystrom Building Products.

B. Non-Rated Access Panels at Ceramic Tile Wall Finishes:
   1. Description: Flush stainless steel access panels and frames.
   2. Product: "JL Industries Model TMS" manufactured by Activar Construction Products Group, Inc., or equal.
   3. Material: Type 304, 0.0625-inch BMT (USSG 16) stainless steel frame with at least 0.0625-inch BMT (USSG 16) stainless steel door.

4. Trim: At least 0.0312-inch BMT (USSG 22) stainless steel flange.
5. Hinge: Concealed continuous piano hinge.

C. Non-Rated Access Panels Elsewhere:
1. Description: Flush concealed frame access panels with wallboard bead.
2. Product: “JL Industries Model TMW” manufactured by Activar Construction Products Group, Inc., or equal.
3. Material: At least 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet frame and 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet door.
4. Trim: At least 0.0299-inch BMT (MSG 22) HDG steel sheet gypsum board tape-in bead flange.
5. Hinge: Concealed continuous piano hinge.
6. Finish: Manufacturer’s standard shop-applied phosphate pre-treatment and baked on rust inhibitive primer for field-applied finish.

D. Fire-Resistance Rated Access Panels:
1. Description: Fire-rated and insulated concealed frame access panel with wallboard bead.
2. Product: “JL Industries Model FDW” manufactured by Activar Construction Products Group, Inc., or equal.
3. Material: At least 0.0598-inch BMT (MSG 16) cold-rolled uncoated steel sheet frame with At least 0.0359-inch BMT (MSG 20) cold-rolled uncoated steel sheet door.
4. Trim: At least 0.0299-inch BMT (MSG 22) HDG steel sheet gypsum board tape-in bead flange.
5. Insulation: At least 2-inch thick fire-resistive mineral wool insulation sandwiched between access panel faces.
6. Hinge: Concealed continuous piano hinge.
7. Finish: Manufacturer’s standard shop-applied phosphate pre-treatment and baked on rust inhibitive primer for field-applied finish.

E. Requisite Properties:
1. Provide at least 24-inch square or larger panel assemblies where servicemen must access spaces through panels.
2. Elsewhere, provide at least 12-inch square panel assemblies.

F. Accessories:
   1. Locking Devices:
      a. Public Areas: Provide one mortise cylinder lock per access door. Key all locks alike, unless otherwise noted.
      b. Other Areas: Provide flush, key-operated cam lock. Key all locks alike, unless otherwise noted.
      c. Panels 24 inches or More in Any Dimension: Provide interior latch to permit access panel opening from inside without a key.
   2. Gaskets: Apply manufacturer's optional gasketing to frames of units that do not come standard with gaskets.
   3. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
   4. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
   1. Install access panels using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed access panels must be warrantable. Do not install, correct, or replace access panels in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach access panels to supporting construction.

C. Installation Tolerances: Install access panels to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet access panel door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible access panel surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed access panels in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed access panels unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed access panels as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 5213
WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood windows.
   2. Site tests and inspections.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AAMA: American Architectural Manufacturers Association.
   2. WDMA: Window & Door Manufacturers Association.
   3. CSA: Canadian Standards Association.

B. Definitions:
   1. Manufacturer: Means the window manufacturer, unless otherwise indicated.
   2. Failure: Includes noise or vibration caused by movement, material deterioration beyond normal weathering, water leakage through fixed glazing and framing areas, and failure of operating components.
   3. Water Leakage: Means no uncontrolled water penetrating assemblies or water appearing on assemblies' normally-exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to the exterior.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate building opening tolerances with window manufacturing and erection tolerances.
   2. Coordinate window hardware finishes with door hardware finishes.

B. Performance Requirements:

1. General: Windows must establish and maintain a continuous watertight seal without failure.
2. Thermal Transmittance (U-Factor): Maximum assembly thermal transmittance value may not exceed the following.
   a. Maximum Winter Nighttime Transmittance (U-value): Not more than 0.36 for fixed assemblies; and 0.46 BTU per hour per square foot per deg. F. for operable assemblies.
   b. Maximum Summer Daytime Transmittance (U-value): Not more than 0.42 BTU per hour per square foot per deg. F.
3. Condensation Resistance Factor (CRF): Minimum CRF value of at least the following, when tested in conformance with NFRC 500.
   a. Combined Framing Members and Glazing: At least 56.
   b. Framing Members Only: At least 70.
4. Sound Transmission Class (STC): Provide complete assemblies (both frame and glazing) having a minimum laboratory-tested STC value of at least that indicated on the Drawings for glass and frame together, as determined in conformance with ASTM E 413, based on testing in conformance with ASTM E 90.
5. Outdoor-Indoor Transmission Class (OITC): Provide complete assemblies (both frame and glazing) having a minimum laboratory-tested OITC value of at least that indicated on the Drawings for glass and frame together, as determined in conformance with ASTM E 413, based on testing in conformance with ASTM E 90.
6. Operating Force for Sliding Window Assemblies: Not more than 30 pounds-force required to open the window, nor more than 20 pounds-force to keep the window in motion, when tested in conformance with ASTM E 2068.
7. Operable Window De-Glazing Test: Operable sash or panel member must not move from the original position, relative to glazing, by more than the glass bite depth, when tested in conformance with ASTM E 987 at a 70 pounds-force concentrated load on vertical rails and a 50 pounds-force concentrated load on other rails.
8. Forced-Entry Resistance: Operable window assemblies within 15 feet of grade or accessible platform must be rated at least Performance Grade 30, when tested in conformance with ASTM F 588 according to window assembly type classification.

9. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
10. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates.

C. Preinstallation Meeting:
1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed windows. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data:
a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

2. Shop Drawings:
    a. Submit dimensioned plans and elevations drawn to scale and showing window layout, materials, construction, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
    b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
3. Samples:
    a. Submit at least 6-inch square representative samples of each window frame and sash color and finish.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished windows.
    a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
    b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:
1. Windows must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
    a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
    b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Windows must conform to the requirements of California Building Code 11B-229.1. Where glazed openings are provided in accessible rooms or spaces for operation by occupants, at least one must conform to the requirements of California Building Code Section 11B-309.

C. Quality Standard Requirements:

1. Product Standard: Windows must conform to the requirements of ANSI/AAMA/WDMA publication ANSI/AAMA/WDMA 101/I.S.2/NAFS-02, "*Windows, Skylights and Glass Doors*".

2. Performance Standard: Comply with the requirements of AAMA/WDMA/CSA publication AAMA/WDMA/CSA 101/I.S.2/A440, "*NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights*".

D. Qualifications:*(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing windows installed on previous projects similar to this project in size, material, design, and complexity.

2. Installer: Company or individuals must have experience installing windows for previous projects similar to this project in size, material, design, and complexity.

3. Supervisors: Individuals must have experience installing windows for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading window installers.

E. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate windows into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective windows with undamaged new windows that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.
B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 WOOD WINDOWS

A. Description: Folding up and out wood-framed window units with integral one-inch nail fin and mitered and fusion-welded corners; and tested and labeled for conformance to AAMA/WDMA/CSA 101/I.S.2/A440 requirements for Class F-LC40 (fixed windows) and Class C-LC50. (operable casement windows)

B. Product: “Series 5000 FoldUp+Out Inline” manufactured by Rochester Colonial Manufacturing Corp., or equal.

C. Requisite Properties:

1. Sizes: Indicated on the Drawings.
2. Exposed Finishes: Solid wood with smooth finish and uniform consistent color.
3. Exterior Color and Interior Finish: Indicated on the Drawings or selected by the Architect.

D. Components:

1. Sash and Frame: Wood conforming to AAMA/WDMA/CSA 101/I.S.2/A440, with exposed exterior wood surfaces finished with manufacturer's standard wood finish.
2. Glazing: Nominal one-inch thick fully tempered dual-glazed IGU conforming to ASTM E 2190 requirements.
   a. Glass Panes: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
   b. Low-E Coating: “Advanced Low-E”, or equal.
   c. Interspace: Hermetically sealed argon-filled interspace.
   d. Seals: Black polyisobutylene primary sealant; black silicone secondary sealant.

2.2 ACCESSORIES

A. Window Sills and Stools: Indicated on the Drawings or selected by the Architect.

B. Wood Insect Screens: Vinyl-coated fiberglass mesh insect screening fabric.

C. Hardware: Manufacturer's standard factory-installed operating hardware; finish must match adjacent door hardware.

D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce framing members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install windows using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed windows must be warrantable. Do not install, correct, or replace windows in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Use concealed fasteners and anchorages. Provide washer head fasteners with bonded sealing washers where required to protect metal surfaces and to make weathertight connections.
2. Form closely-fitted joints with exposed connections accurately located and secured.
3. Provide uniform-width perimeter reveals and opening sealants and joint fillers as indicated.
4. Install concealed gaskets, flashings, and joint fillers as the window installation progresses.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach windows to supporting construction.

D. Installation Tolerances: Install windows to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet window and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
   a. Schedule and arrange all tests and inspections.
   b. Coordinate all work and the final construction schedule with all tests and inspections.
   c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
   d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
   e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
   f. Witness all site tests and inspections.
   g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
   h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.
2. Required Tests:
   a. Water Leakage Hose Tests: Perform water leakage hose tests in conformance with ASTM AAMA 501.2 (fixed glazing assemblies) and AAMA 502 (operable window units).

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Cleaning Work: Clean all visible window surfaces in a manner that does not result in any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

A. Protect installed windows in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed windows unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed windows as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08-5214

METAL-CLAD WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal-clad wood windows.
   2. Site tests and inspections.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AAMA: American Architectural Manufacturers Association.
   2. WDMA: Window & Door Manufacturers Association.
   3. CSA: Canadian Standards Association.

B. Definitions:
   1. Manufacturer: Means the window manufacturer, unless otherwise indicated.
   2. Failure: Includes noise or vibration caused by movement, material deterioration beyond normal weathering, water leakage through fixed glazing and framing areas, and failure of operating components.
   3. Water Leakage: Means no uncontrolled water penetrating assemblies or water appearing on assemblies' normally-exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to the exterior.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate building opening tolerances with window manufacturing and erection tolerances.
   2. Coordinate window hardware finishes with door hardware finishes.

B. Performance Requirements:
   1. General: Windows must establish and maintain a continuous watertight seal without failure.

2. Thermal Transmittance (U-Factor): Maximum assembly thermal transmittance value may not exceed the following.
   a. Maximum Winter Nighttime Transmittance (U-value): Not more than 0.36 for fixed assemblies; and 0.46 BTU per hour per square foot per deg. F. for operable assemblies.
   b. Maximum Summer Daytime Transmittance (U-value): Not more than 0.42 BTU per hour per square foot per deg. F.
3. Condensation Resistance Factor (CRF): Minimum CRF value of at least the following, when tested in conformance with NFRC 500.
   a. Combined Framing Members and Glazing: At least 56.
   b. Framing Members Only: At least 70.
4. Sound Transmission Class (STC): Provide complete assemblies (both frame and glazing) having a minimum laboratory-tested STC value of at least that indicated on the Drawings for glass and frame together, as determined in conformance with ASTM E 413, based on testing in conformance with ASTM E 90.
5. Outdoor-Indoor Transmission Class (OITC): Provide complete assemblies (both frame and glazing) having a minimum laboratory-tested OITC value of at least that indicated on the Drawings for glass and frame together, as determined in conformance with ASTM E 413, based on testing in conformance with ASTM E 90.
6. Operating Force for Sliding Window Assemblies: Not more than 30 pounds-force required to open the window, nor more than 20 pounds-force to keep the window in motion, when tested in conformance with ASTM E 2068.
7. Operable Window De-Glazing Test: Operable sash or panel member must not move from the original position, relative to glazing, by more than the glass bite depth, when tested in conformance with ASTM E 987 at a 70 pounds-force concentrated load on vertical rails and a 50 pounds-force concentrated load on other rails.
8. Forced-Entry Resistance: Operable window assemblies within 15 feet of grade or accessible platform must be rated at least Performance Grade 30, when tested in conformance with ASTM F 588 according to window assembly type classification.
9. Thermal Expansion and Contraction: Accommodate movement resulting from at least 120 deg. F ambient and 180 deg. F material surface temperature differentials (changes).
10. Dissimilar Metal Corrosion Protection: Permanently isolate metal surfaces from direct contact with incompatible materials and other potentially corrosive substrates as specified in Section 05 50 10.

C. Preinstallation Meeting:
   1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
   2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
   3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed windows. Resolve each condition.
   4. Finalize construction schedule.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Windows must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
   1. Windows must conform to the requirements of California Building Code 11B-229.1. Where glazed openings are provided in accessible rooms or spaces for operation by occupants, at least one must conform to the requirements of California Building Code Section 11B-309.

C. Quality Standard Requirements:
   1. Product Standard: Windows must conform to the requirements of ANSI/AAMA/WDMA publication ANSI/AAMA/WDMA 101/I.S.2/NAFS-02, "*Windows, Skylights and Glass Doors*".
   2. Performance Standard: Comply with the requirements of AAMA/WDMA/CSA publication AAMA/WDMA/CSA 101/I.S.2/A440, "*NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights*".

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*
   1. Manufacturer: Company or individuals must have experience manufacturing windows installed on previous projects similar to this project.
   2. Installer: Company to have experience installing windows similar to this project.
   3. Supervisors: Individuals must have experience installing windows for previous projects similar to this project in size, material, design, and complexity.

E. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate windows into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective windows with undamaged new windows that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years; and for metal finishes against color fading, chalking, cracking, checking, peeling, and adhesive failure for 20 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Kolbe Windows and Doors.
   2. Marvin Windows and Doors, Inc.
   3. Pella Corp.

2.2 METAL CLAD WOOD WINDOWS

A. Description: Metal-clad wood window units formed from hot-rolled new billet steel sections and tested and labeled for conformance to AAMA/WDMA/CSA 101/I.S.2/A440 requirements for at least Class LC-PG50.

B. Products: “Casement Push Out Window - UFCA PO” manufactured by Marvin Windows and Doors, Inc., or equal.

C. Requisite Properties:
   1. Types: Indicated on the Drawings.
   2. Glass and Glazing Accessories: Specified in Section 08 81 00.
   3. Finish: Manufacturer’s standard powder coat finish.
   4. Exterior Color and Interior Finish: Indicated on the Drawings.

D. Components:
   1. Sash and Frame: Select wood, water water-repellent and preservative-treated in conformance with WDMA I.S.-4. Wood water repellent applied to the frame must also contain fungicides and an insecticide.
   2. Interior Exposed Surfaces: Douglas fir and edge banded. Primed and field painted.
   3. Exterior Surfaces: Clad with aluminum at head and jambs. Solid extruded aluminum with manufacturer’s standard brown 2-coat finish at sill with composite black threshold for door.
   4. Glazing: Nominal one-inch thick fully tempered dual-glazed IGU conforming to ASTM E 2190 requirements.
      a. Glass Panes: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
      b. Low-E Coating: “Solarban 60” manufactured by Vitro Architectural Glass, or equal.
      c. Interspace: Hermetically sealed argon-filled interspace.
      d. Seals: Black polyisobutylene primary sealant; black silicone secondary sealant.

2.3 ACCESSORIES

A. Window Sills and Stools: Indicated on the Drawings, or equal.

B. Fiberglass Insect Screens:
   1. Description: Vinyl-coated fiberglass mesh insect screening fabric.
   2. Product: “Phiferglass” manufactured by Phifer Wire Products, Inc., or equal.
   3. Requisite Properties:
      a. Window and Door Screens: 18x16 nominal mesh count, woven from 0.010-inch diameter permanent glass yarn; 59 percent minimum free area (openness).
      b. Pool, Patio and Porch Screen: 18x14 nominal mesh count, woven from 0.013-inch diameter permanent glass yarn; 58 percent minimum free area (openness).

c. No-See-Um Mesh Screen: 20x20 nominal mesh count, woven from 0.013-inh diameter permanent glass yarn; 45 percent minimum free area (openness).
d. Color: Match Phifer color “Black”.
e. Frame: Rolled aluminum frame; match window finish.

C. Hardware: Manufacturer's standard factory-installed operating hardware; finish must match adjacent door hardware.

D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.
1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce framing members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install windows using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed windows must be warrantable. Do not install, correct, or replace windows in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Use concealed fasteners and anchorages. Provide washer head fasteners with bonded sealing washers where required to protect metal surfaces and to make weathertight connections.
2. Form closely-fitted joints with exposed connections accurately located and secured.
3. Provide uniform-width perimeter reveals and opening sealants and joint fillers as indicated.
4. Install concealed gaskets, flashings, and joint fillers as the window installation progresses.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach windows to supporting construction.

D. Installation Tolerances: Install windows to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet window and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 FIELD QUALITY CONTROL

A. Site Tests and Inspections:
1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
   a. Schedule and arrange all tests and inspections.
   b. Coordinate all work and the final construction schedule with all tests and inspections.
   c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.

d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
f. Witness all site tests and inspections.
g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.

2. Required Tests:
   a. Water Leakage Hose Tests: Perform water leakage hose tests in conformance with ASTM AAMA 501.2 (fixed glazing assemblies) and AAMA 502 (operable window units).

3.5 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.6 CLEANING

A. Cleaning Work: Clean all visible window surfaces in a manner that does not result in any warranty or guarantee becoming void.
   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.

2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.7 PROTECTION

A. Protect installed windows in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed windows unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed windows as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware, including electric hardware.
2. Power supplies for electric hardware.
3. Low energy door operators plus sensors and actuators.

B. Related Divisions:

1. Division 06 – door hardware installation
2. Division 07 – sealant at exterior thresholds
3. Division 08 – metal doors and frames, interior aluminum frames, wood doors, integrated security systems, specialty doors, storefront and glazed curtainwall systems.
4. Division 10 – operable partitions
5. Division 21 – fire and life safety systems
6. Division 28 – security access systems

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Folding partitions, except cylinders where detailed.
9. Sliding aluminum doors, except cylinders where detailed.
10. Access doors and panels, except cylinders where detailed.
11. Corner Guards.
12. Welded steel gates and supports.

1.2 REFERENCES**:**

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
   a) ANSI 156.18 – Materials and Finishes.
2. BHMA – Builders Hardware Manufacturers Association
3. 2019 California Building Code
   a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
4. DHI – Door and Hardware Institute

5. NFPA – National Fire Protection Association

   a) NFPA 80 2019 Edition – Standard for Fire Doors and Other Opening Protectives.
   b) NFPA 105 – Smoke and Draft Control Door Assemblies
   c) NFPA 252 – Fire Tests of Door Assemblies

6. UL – Underwriters Laboratories

   a) UL10C – Positive Pressure Fire Tests of Door Assemblies.
   b) UL 305 – Panic Hardware

7. WHI – Warnock Hersey Incorporated State of California Building Code
8. Local applicable codes
9. SDI – Steel Door Institute
10. WI – Woodwork Institute
11. AWI – Architectural Woodwork Institute
12. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers**:** see table at 2.1.A of this section
2. Finishes**:** see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS**:** Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information**:**

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Point-to-point wiring diagrams.
12. Manufacturer’s technical data and installation instructions for electronic hardware.
13. Date of jobsite visit.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

C. Deviations**:** Highlight, encircle or otherwise identify deviations from “Schedule of Finish Hardware” on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE**:**

A. Qualifications**:**

1. Hardware supplier**:** direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware**:** Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors**:** Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings**:** NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings**:** Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.5 DELIVERY, STORAGE AND HANDLING**:**

A. Delivery**:** coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores**:** secured delivery direct to Owner's representative.

B. Acceptance at Site**:** Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage**:** Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION**:**

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination**:** Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information**:**

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
6. Coordinate: back-up power for doors with automatic operators.
7. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
8. Manufacturers' templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations**:** segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

E. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.

1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 WARRANTY**:**

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents warranty information:

C. Minimum warranties:

1.	Locksets**:**	Three years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices**:**	Three years mechanical One year electrical
4.	Closers**:**	Thirty years mechanical Two years electrical
5.	Hinges**:**	One year
6.	Other Hardware	Two years

1.8 COMMISSIONING**:**

A. Conduct these tests prior to request for certificate of substantial completion**:**

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 PRODUCTS

2.1 MANUFACTURERS**:**

A. Listed acceptable alternate manufacturers**:** these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM**:**	MANUFACTURER**:**	ACCEPTABLE ALTERNATE**:**
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Select
Key System	(SCH) Schlage	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood, Trimco
Push & Pull Plates	(IVE) Ives	Rockwood, Trimco
Security Pulls	(IVE) Ives	Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(ZER)Zero	NGP, Reese
Seals & Bottoms	(ZER)Zero	NGP, Reese

2.2 HINGING METHODS**:**

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Doors 3’6” or wider use 5” X 41/2” heavy weight hinges

C. Doors 8’0” use 4 hinges and add 1 hinge for every foot thereafter

D. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

E. Conventional Hinges**:** Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors**:** stainless steel hinges with non-removable (NRP) pins and security studs.
2. Stainless steel material exteriors and at doors subject to corrosive atmospheric conditions.

F. Continuous Hinges**:**

1. Geared-type aluminum.

a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
b) If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powdercoat finishes subject to Architect approval.

2. Pinned steel/stainless steel type**:** continuous stainless steel, 0.25-inch diameter stainless-steel hinge pin.

a) Use engineered application-specific wide-throw units as needed to provide maximum swing degree of swing, advise architect if required width exceeds 8 inches.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS**:**

A. Mortise Locksets and Latchsets**:** as scheduled.

1. Chassis**:** cold-rolled steel, handing field-changeable without disassembly.
2. Universal lock case – 10 functions in one case.
3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts**:** 0.75 inch throw stainless steel anti-friction type.
5. Lever Trim**:** through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

a) Spindles**:** security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
c) Levers rotate up or down for ease of use.

6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces**:** accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Strikes**:** 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Scheduled Lock Series and Design**:** Schlage L series, Design to be 06A

10. Certifications**:**

    a) ANSI A156.13, 1994, Grade 1 Operational,
    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

11. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2019 11B-404.2.7 and 11B-309.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features**:**

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75 inch projection.
4. End caps**:** impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
8. Lever design to match locksets
9. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2019 11B-404.2.7 and 11B-309.4.

    a) Mechanical method: where touchpad directly retracts the latchbolt with 5 lb or less of force.

B. Specific features**:**

1. Non-Fire Rated Devices**:** hex key dogging.
2. Lever Trim**:** breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.
3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
4. Fire-Labeled Devices**:** UL label indicating “Fire Exit Hardware”. Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. alarm input. NFPA 101 “Special Locking Arrangement” compliant.
6. Electrically Operated Devices**:** Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.

2.6 CLOSERS

A. Surface Closers**:** 4040-XP

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.

4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2019 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
    a) Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers**:** tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors**:** seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.

B. LCN Senior Swing**:**

1. Comply with ANSI/BHMA 156.19 and 2019 California Building Code Section 11B-404.2.9, Exception 2**:** Electric power-open. Modular construction. Finished metal cover. Field-adjustable opening force, opening speed, time-open, closing and latching speeds. Door reopens and timing cycle restores if system reactuated during closing cycle. Breakaway clutch protection from forced closing. Door, frame, motor and drive train protected by attenuated initiation of opening cycle.
2. Self-contained low-voltage power supply, terminal strip and sequencing for incorporation of electric hardware with system operation.
3. Actuators: as scheduled
    a) Vertical bar type: minimum 2 inches wide by 30 inches in height. Locate bar with bottom 5 inches maximum above finish floor, and top 35 inches minimum above finish floor.
4. Safety sensors**:** as scheduled.

2.7 OTHER HARDWARE

A. Automatic Flush Bolts**:** Low operating force design.

B. Overhead Stops**:** Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates**:** Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops**:** Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
2. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
3. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum**:** 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Thresholds**:** As scheduled and per details. Comply with CBC 2019 11B-404.2.5. Substitute products**:** certify that the products equal or exceed specified material's thickness. Proposed substitutions**:** submit for approval.

1. Saddle thresholds**:** 0.125 inches minimum thickness.
2. Exteriors**:** Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
4. Fasteners**:** Generally, exposed screws to be Phillips or Robertson drive.

F. Through-bolts**:** Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

1. Exception**:** surface-mounted overhead stops, holders, and friction stays.

G. Silencers**:** Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent**:** door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal. Provide where seals are not used

2.8 FINISH**:**

1. Generally**:** BHMA 613 Dark Bronze Areas using BHMA 613: furnish push-plates, pulls and protection plates of BHMA 613

H. Door closers**:** factory powder coated to match other hardware, unless otherwise noted.

2.9 KEYING REQUIREMENTS**:**

A. KEYING REQUIREMENTS**:**

B. Key System**:** Keying, keyways, system secuity etc will be determined at a later time. For estimate use standard cores with the following

C. Keys

2. Factory registered master key system

3. Non-I.C. construction keying**:** furnish inserted type partial key. At substantial completion, remove inserts in Owner's presence; demonstrate consequent non-operability of construction key. Give all removed inserts and all construction keys to Owner, provide accounting for all the pieces.
4. Temporary cylinders/cores remain supplier's property.
5. Furnish 10 construction keys.
6. Furnish 2 construction insert extractor tool 35-057.
7. Furnish 2 construction control keys.

D. Key Cylinders**:** furnish, 6-pin solid brass construction.

E. Cylinders/Cylinder cores**:** furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

F. Permanent keys**:** furnish secured shipment direct from point of origination to Owner.

8. For estimate**:** 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
9. For estimate**:** VKC stamping plus "DO NOT DUPLICATE".

G. Bitting List**:** furnish secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS**:**

A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION**:**

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.
1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1010.1.9.2 and 11B-404.2.7.
2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops**:** before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

D. Existing frames and doors to be retrofitted with new hardware**:**

1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.
2. Remove existing floor closers not scheduled for reuse, fill cavities with non-shrinking concrete and finish smooth.
3. Cut and weld existing steel frames currently prepared with 2.25 inch height strikes. Cut an approximate 8 inch section from the strike jamb and weld in a reinforced section to accommodate specified hardware's strike.
4. Patch and weld flush filler pieces into existing door hardware preparations in steel doors and frames, leave surfaces smooth.
5. Glue in solid wood block fillers to fill cut outs in existing wood doors, sand surfaces smooth. Alternatively, use an approved epoxy-based wood filler product, submit product data for approval.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets**:** install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

G. Field-verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware.

H. Remove existing hardware not being reused. Tag and bag removed hardware, turn over to Owner.

I. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed, extended arms on closers.

J. Provide manufacturer's recommended brackets to accommodate the mounting of closers on doors with flush transoms.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods**:** repair or replace to Owner's satisfaction.
2. Adjust doors to fully latch with no more than 1 pound of pressure.

a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
4. Adjust door closers per 1.9 this section.

B. Fire-rated doors**:**

1. Wood doors**:** adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors**:** adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

C. Final inspection**:** Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following**:**

1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

3.5 DEMONSTRATION**:**

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING**:**

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

HW SET: 002

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PUSH PLATE	8200 4" X 16"	613	IVE
1	EA	PULL PLATE	8300 4" X 16"	613	IVE
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 010

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PASSAGE	L9010 06A	613	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 012.2

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PASSAGE	L9010 06A	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER

HW SET: 020

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06A	613	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 022

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06A	613	SCH

1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 022.1

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY W/INDICATOR	L9440-L583-363-L283-722 06A	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 030

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	OFFICE LOCK	L9050P L583-363 06A	613	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 032

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	OFFICE LOCK	L9050P L583-363 06A	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 034

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	OFFICE LOCK	L9050P L583-363 06A	613	SCH
1	EA	CLOSER	4040XP H	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 050

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	L9080P 06A	613	SCH
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 052

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	L9080P 06A	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 082

3	EA	HINGE	3CB1 4.5 X 4.5	613	IVE
1	EA	EXIT DEVICE	AX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 086.6

3	EA	HINGE	3CB1HW 4.5 X 4.5	640	IVE
1	EA	EXIT DEVICE	AX-98-L-NL-996L-06-LD	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	CLOSER	4040XP S-CUSH	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 099

1	EA	CONTINUOUS HINGE	224XY EPT	DUR	IVE
1	EA	POWER TRANSFER	EPT-10	690	VON
1	EA	ELECTRIC EXIT DEVICE	QELX-RX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	AUTO. OPERATOR	9540 SERIES	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FULL LENGTH ACTUATOR	8310-836TW	630	LCN
2	EA	TRANSMITTER	8310-844		LCN
1	EA	RECEIVER	8310-865		LCN

1	EA	A/O POWER SUPPLY	PS904 X 900-4RL X 900-BBK	VON

CARD READER AND WIRING BY OTHERS

HW SET: 152.2

3	EA	HINGE	3CB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	L9080P 06A	613	SCH
1	EA	CLOSER	4040XP	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	DOME STOP	FS436/438 AS REQ'D	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	EA	DOOR SWEEP	339D	DUR	ZER

HW SET: 452

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	613	IVE
1	EA	STOREROOM LOCK	L9080P 06A	613	SCH
1	EA	CLOSER	4040XP EDA	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER

HW SET: 482.6

3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP SEC STUD	613	IVE
1	EA	EXIT DEVICE	AX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	CLOSER	4040XP EDA	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER

HW SET: 483

3	EA	HINGE	3CB1 4.5 X 4.5 NRP SEC STUD	613	IVE
1	EA	EXIT DEVICE	AX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	CLOSER	4040XP S-CUSH	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER

1	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER

HW SET: 901

			ALL HARDWARE BY DOOR MANUFACTURER		B/O

HW SET: 971

1	EA	EXIT DEVICE	AX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
			BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 973

			ALL HARDWARE BY GATE MANUFACTURER		B/O

HW SET: 974

2	EA	EXIT DEVICE	AX-98-L-996L-06	313	VON
2	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
2	EA	PERMANENT CORE	23-030	613	SCH
			BALANCE OF HARDWARE BY GATE MANUFACTURER		B/O

GATE MUST HAVE CENTER POST FOR PANICS TO LATCH TO

HW SET: E435

			REUSE EXISTING HANGING DEVICES		EXI
1	SET	AUTO FLUSH BOLT	FB32	613	IVE
1	EA	OFFICE LOCK	L9050P L583-363 06A	613	SCH
2	EA	OVERHEAD HOLDER	90H	613	GLY
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	SET	MEETING ASTRAGAL	328D	DUR	ZER
2	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER

HW SET: E499

1	EA	CONTINUOUS HINGE	224XY EPT	DUR	IVE
1	EA	POWER TRANSFER	EPT-10	690	VON
1	EA	ELECTRIC EXIT DEVICE	QELX-RX-98-L-996L-06	313	VON
1	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
1	EA	PERMANENT CORE	23-030	613	SCH
1	EA	AUTO. OPERATOR	9540 SERIES	690	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER
2	EA	FULL LENGTH ACTUATOR	8310-836TW	630	LCN
2	EA	TRANSMITTER	8310-844		LCN
1	EA	RECEIVER	8310-865		LCN
1	EA	A/O POWER SUPPLY	PS904 X 900-4RL X 900-BBK		VON

HW SET: E582V

			REUSE EXISTING HANGING DEVICES		EXI
2	EA	EXIT DEVICE	9827-L-996L-06	313	VON
2	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
2	EA	PERMANENT CORE	23-030	613	SCH
2	EA	CLOSER	4040XP EDA	690	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW	613	IVE
2	EA	ROD & LATCH GUARD	RG-27	613	VON
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	SET	MEETING ASTRAGAL	328D	DUR	ZER
2	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER

HW SET: E599V

2	EA	CONTINUOUS HINGE	224XY EPT	DUR	IVE
2	EA	POWER TRANSFER	EPT-10	690	VON
2	EA	ELECTRIC EXIT DEVICE	QEL-RX-9827L-996L-06	313	VON
2	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
2	EA	PERMANENT CORE	23-030	613	SCH
1	EA	AUTO. OPERATOR	9550 SERIES	690	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW	613	IVE
2	EA	ROD & LATCH GUARD	RG-27	613	VON
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE

1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	SET	MEETING ASTRAGAL	328D	DUR	ZER
2	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER
2	EA	FULL LENGTH ACTUATOR	8310-836TW	630	LCN
2	EA	TRANSMITTER	8310-844		LCN
1	EA	RECEIVER	8310-865		LCN
1	EA	A/O POWER SUPPLY	PS906 X 900-4RL X 900-BBK		VON

HW SET: E799V

2	EA	CONTINUOUS HINGE	224XY EPT	DUR	IVE
2	EA	POWER TRANSFER	EPT-10	690	VON
2	EA	FIRE ELECTRIC EXIT DEVICE	QEL-RX-9827L-F-996L-06	313	VON
2	EA	IC RIM CYLINDER	20-057-ICX	613	SCH
2	EA	PERMANENT CORE	23-030	613	SCH
1	EA	AUTO. OPERATOR	9550 SERIES	690	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW	613	IVE
2	EA	ROD & LATCH GUARD	RG-27	613	VON
2	EA	FLOOR STOP	FS441/442 AS REQUIRED	613	IVE
1	SET	PERIMETER SEALS	328D HEAD AND JAMBS	DUR	ZER
1	SET	MEETING ASTRAGAL	328D	DUR	ZER
2	EA	DOOR SWEEP	339D	DUR	ZER
1	EA	THRESHOLD	AS DETAILED	DUR	ZER
2	EA	FULL LENGTH ACTUATOR	8310-836TW	630	LCN
2	EA	TRANSMITTER	8310-844		LCN
1	EA	RECEIVER	8310-865		LCN
1	EA	A/O POWER SUPPLY	PS906 X 900-4RL X 900-BBK		VON

END OF SECTION

SECTION 08 8100
GLASS GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Annealed glass.
2. Strengthened glass.
3. Coated glass.
4. Laminated glass.
5. Insulating glass units.
6. Delegated design of glazing.
7. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
1. Section 08 83 13 for mirrored glass.

1.2 REFERENCES

A. Abbreviations and Acronyms:
1. GANA: Glazing Association of North America.
2. IGCC: Insulating Glass Certification Council.
3. IGMA: Insulating Glass Manufacturers Alliance.
4. IGU: Insulating Glass Unit.
5. NGA: National Glass Association.
6. PVB: Polyvinyl Butyral.
7. SGCC: Safety Glazing Certification Council
8. SIGMA: Sealed Insulating Glass Manufacturers Association.

B. Definitions:
1. Manufacturer: Means the glass manufacturer, unless otherwise indicated.
2. Fabricator: Means the glass fabricator, unless otherwise indicated.

3. Failure: Includes material deterioration beyond normal weathering, coating degeneration, the development of defects not attributed to glass breakage or to maintaining and cleaning coated glass contrary to the manufacturer or fabricator instructions, failure of a IGU hermetic seals, and failure of glazing sealants or gaskets to remain watertight and airtight.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate IGU spacer finish with all finishes of framing into which IGUs are installed.

B. Delegated Design Requirements:

1. Engineer, fabricate, assemble, and install glazing that conforms to the sizes and thicknesses indicated and other Contract Document requirements; meets specified performance requirements; and results in structurally sound and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

C. Performance Requirements:

1. General: Installed glass glazing must establish and maintain a continuous watertight seal without failure.
2. Design Pressure: Calculate in conformance with American Society of Civil Engineers/ Structural Engineering Institute publication ASCE/SEI 7, "*Minimum Design Loads and Associated Criteria for Buildings and other Structures*".
3. Load Resistance: Provide glazing materials conforming to ASTM E 1300.
4. Differential Shading: Accommodate, resist, distribute, or transfer thermal stresses induced by differential shading within individual glass lites.
5. Glass Thickness: Thicknesses indicated are estimates; determine actual required thicknesses. Overall thickness of each glass type and composite thickness of multiple-layer glass types must be consistent throughout the project.
   a. Minimum thicknesses must be such that the probability of breakage at design pressure does not exceed 8 lights per 1,000 lights (SF 2.5), based on a 3-second gust wind load duration and the reflectance and shading indicated.
   b. Exterior glass thickness must beat at least 6.0mm (nominal 1/4-inch).

6. Minimum Glass Bite Depth: At least 3/8-inch glass bite depth for 6mm (nominal 1/4-inch) monolithic lites, and 1/2-inch for 12mm (nominal 1/2-inch) laminated glass and 25mm (nominal one-inch) IGUs, unless otherwise indicated.
7. Minimum Edge Clearance: At least 1/4-inch for 6mm (nominal 1/4-inch) monolithic lites, 12mm (nominal 1/2-inch) laminated glass, and 25mm (nominal one-inch) IGUs, unless otherwise indicated.
8. Minimum Face Clearance: At least 1/8-inch inch for 6mm (nominal 1/4-inch) monolithic lites and 12mm (nominal 1/2-inch) laminated glass, and 3/16-inch for 25mm (nominal one-inch) IGUs, unless otherwise indicated.
9. Safety Glazing Requirements: Provide either laminated glass or fully tempered glass conforming to ANSI Z97.1 requirements for Drop Height Class A wherever safety glazing is indicated or required. Wire glass is prohibited.
10. Other Requirements: Installed glass must be free from rattle.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data:
      a. Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
      b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
   2. Glazing Schedule: Submit glazing schedule indicating glazing types, locations, sizes, thicknesses, and extents.
   3. Samples: Submit at least 8-inch square representative samples of each glass and fabricated glass assembly type, color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
   a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
   b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
   c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Glazing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.

B. Safety Glazing Certification:

1. Each pane of safety glass delivered to the project site must be furnished with a permanent identification label or mark that identifies the labeler and indicates that safety glazing material is utilized for the installation. Each label must be permanently affixed in a location such that the label remains visible after the pane of glass is installed.

2. Each pane of tempered glass delivered to the project site must be furnished with a permanent identification label or mark etched or ceramic-fired onto the glass surface that identifies the manufacturer or fabricator and indicates that tempered glass is utilized for the installation. Each label or mark must be permanently affixed in a location such that the label or mark remains visible after the pane of glass is installed.

C. Insulating Glass Certification:

1. Each insulating glass unit delivered to the project site must be furnished with a permanent certification label issued by the Insulating Glass Certification Council (IGCC) (which assures quality and performance of sealed insulating glass products) or the National Accreditation and Management Institute (NAMI) (which assures the buyer that the purchase product is the same product that was tested by an independent laboratory, and performs to the level that the test report reflects) that identifies the labeler and indicates the performance of sealed insulating glass units utilized for the installation; each label must be permanently affixed in a location such that the label remains visible after the glass unit is installed.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing glazing installed on previous projects similar to this project in size, material, design, and complexity.
2. Fabricator: Company or individuals must have experience fabricating glazing installed on previous projects similar to this project in size, material, design, and complexity.
3. Installer: Company or individuals must have experience installing glazing for previous projects similar to this project in size, material, design, and complexity.
4. Supervisors: Individuals must have experience installing glazing for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading glazing installers.

2. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate glazing into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.

   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective glass with undamaged new glass that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 5 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 PRIMARY GLASS MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Guardian Industries Corp.
   2. Pilkington North America, Inc.
   3. PPG Industries.
   4. Saint-Gobain Corp.

2.2 MANUFACTURED GLASS

A. Clear Annealed Vision Glass:
   1. Description: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).

B. Ultra-Clear (Low Iron) Annealed Vision Glass:
   1. Description: ASTM C 1036, Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
   2. Products: Provide one of the following, or equal.
      a. “UltraWhite” manufactured by Guardian Industries Corp.
      b. “OptiWhite” manufactured by Pilkington North America, Inc.
      c. “Starphire” manufactured by PPG Industries.
      d. “DIAMANT” manufactured by Saint-Gobain Glass.
   3. Performance Requirements:
      a. Visible Light Transmittance (VLT): At least 90 percent at 6mm thickness.

2.3 SECONDARY GLASS FABRICATORS

A. Fabricators: Provide products fabricated by one of the following, or equal.
   1. Oldcastle BuildingEnvelope Corp.
   2. PPG Industries.
   3. Viracon, Inc.

2.4 FABRICATED GLASS

A. Heat-Strengthened Glass:
   1. Description: ASTM C 1048, Kind HS (heat strengthened), Condition A (uncoated surfaces), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
   2. Minimum Surface Compression Strength (up to 1/4-inch thick): 4,000 to 7,000 pounds per square inch.

3. Minimum Surface Compression Strength (5/16 to 3/8-inch thick): 5,000 to 8,000 pounds per square inch.
4. Fabrication:
    a. Except where not practicable due to glass size, fabricate tempered glass by the horizontal (roller hearth) process with roll wave distortion parallel to the bottom glass edge when installed, unless otherwise indicated.
    b. Do not exceed 1/32-inch bow and warp tolerances.

B. Fully-Tempered (Toughened) Glass:
1. Description: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Minimum Surface Compression Strength: At least 10,000 pounds per square inch.
3. Fabrication:
    a. Fabricate tempered glass by the horizontal (roller hearth) process with roll wave distortion parallel to the bottom glass edge when installed, unless otherwise indicated.
    b. Glazing materials must be free from bubbles, smoke vanes, air holes, scratches and other defects, having ground and arrised edges; provide polished edges where exposed.
4. Source Quality Control:
    a. Individual tempered glass lites installed overhead and floor-to-ceiling tempered glass lites installed adjacent to walking surfaces must be fully heat soak tested by the manufacturer or fabricator before delivery to the project site.
    b. Other tempered glass lites may have statistical heat soak testing performed to demonstrate nickel sulfide breakage does not exceed 0.1 percent.

C. Vacuum Deposition-Coated (Sputter-Coated) Vision Glass:
1. Description: ASTM C 1376, Kind CV (coated vision – if glass can be approached within 10 feet or less) or CO (coated overhead – if distance is greater than 10 feet) as applicable; and ASTM C 1048, Kind HS (heat strengthened) or FT (fully tempered) as indicated, Condition C (other coated glass), Type I (transparent flat glass), Class 1 (clear), Quality Q3 (select glazing applications).
2. Coating: Either spectrally selective or hybrid low-emissivity coating (low-E coating) scheduled at the end of this Section.

D. Laminated Glass:
1. Description: ASTM C 1172, Kind LA (laminated annealed), Kind LHS (laminated heat strengthened), or Kind LT (laminated fully tempered) as scheduled.

2. Glass Panes: Indicated on the Drawings or selected by the Architect, or equal.
3. PVB Interlayer:
   a. Product: “Saflex” manufactured by Eastman Chemical Co. or “Butacite” manufactured by E.I. du Pont de Nemours & Co., Inc. (DuPont), or equal.
   b. Opacity: Clear, translucent white (either acid etch or simulated sandblast), or opaque white interlayer indicated on the Drawings or selected by the Architect.
4. Ionoplast Interlayer:
   a. Product: “SentryGlas Plus” manufactured by E.I. du Pont de Nemours & Co., Inc. (DuPont), or equal.
   b. Color: Clear or translucent interlayer indicated on the Drawings or selected by the Architect.
5. Fabrication: Glass must conform to the requirements of ASTM C 1172, “*Standard Specification for Laminated Architectural Flat Glass”.* Fabricate laminated glass free from foreign substances, and from air or glass pockets.

E. Insulating Glass Units:
1. Description: ASTM C 2190.
2. Glass Panes: Indicated on the Drawings or selected by the Architect, or equal.
3. Low-E Coating: “Solarban 60” manufactured by Vitro Architectural Glass, or equal.
4. Interspace: Hermetically sealed air-filled interspace.
   a. Spacer Material: Mill finish aluminum.
   b. Spacer Corner Construction: Provide spacers and splices with no visible seams; and with soldered/welded corners.
   c. Desiccant: Either molecular sieve or silica gel, or a blend of both, provided on all four sides.
5. Seals: Black polyisobutylene primary sealant; black silicone secondary sealant.
6. Edge Deletion: To promote full adhesion of primary sealant, low “E” coatings at the glass perimeter must be removed before fabrication, as required, recommended, authorized, sanctioned, or accepted by the manufacturer.
7. Fabrication: IGU assemblies conforming to IGMA publication TB-3000, “*North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use*”.

2.5 ACCESSORIES

A. Spacer Shims: Continuous shims fabricated from load-bearing, non-leaching, high-impact polystyrene.

B. Setting Blocks: Elastomeric silicone rubber conforming to ASTM C 1115, CH9.

C. Setting Blocks, Spacers and End Blocks: Provide the following, unless another type, hardness, class, or surface is supplied, required, recommended, authorized, sanctioned, or accepted by the glass installer.

   1. Setting Blocks: Elastomeric silicone rubber conforming to ASTM C 1115, CH9.

   2. Spacers for Structural Silicone Glazing: Elastomeric silicone rubber conforming to ASTM C 1115, CH6S1.

D. Glazing Gaskets: Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

   1. Firm, Dense Gaskets: Elastomeric silicone or EPDM rubber conforming to ASTM C 1115, CH7S2 unless another type, hardness, class or surface is supplied, required, recommended, approved, or accepted by the glass installer.

   2. Soft, Closed Cell Gaskets: ASTM C 509. Provide silicone or EPDM rubber with pre-molded corners.

E. Backer Rod for Butt Joints: Square bi-cellular backer rod; color matching silicone sealant.

F. Cleaners, Primers, Sealers: Supplied, required, recommended, or accepted by the manufacturer or fabricator.

G. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install glazing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set glazing true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed glazing must be warrantable. Do not install, correct, or replace glazing in a manner that is un-warrantable by the manufacturer; or that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach glazing to supporting construction.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible glazing surfaces in a manner that does not result in any warranty or guarantee becoming void. Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed glazing in place from deterioration and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed glazing unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed glazing surfaces as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 8313
MIRRORED GLASS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mirrored glass.
2. Mirror hardware.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the mirrored glass manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples: Submit at least 8-inch long representative samples of each mirrored glass hardware type, color, finish, and variety.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Submit manufacturer-prepared published instructions for proper installation of furnished mirrored glass.
   2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
   1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.4 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items as shipped, upright in their original packaging or containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas. Prevent stored items from contacting the floor or ground and from deterioration and damage.
C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.
D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.5 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.

PART 2 - PRODUCTS

2.1 MIRRORED GLASS

A. Clear Annealed Mirrored Glass:

1. Description: 6.0mm thick (nominal 1/4-inch) silvered annealed monolithic clear glass mirrors conforming to ASTM C 1503, Mirror Stock Sheet (mirrors intended for architectural use and where trimming is required), Quality Q-1 (Mirror Select Quality), Clear Glass Mirrors.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
   a. Guardian Industries.
   b. National Glass Industries.

B. Mirror Backing:

1. Protective Copper Coating: “Paint Mirror Backing Copper” manufactured by Sommer & Maca, or equal.
2. Backing Sealer: “Mirro-Bac” flat black, lead-free, industrial quality mirror backing paint manufactured by Palmer Products, or equal.

2.2 MIRROR HARDWARE

A. Bottom Supporting Angles: “Catalog No. D636A” 1/4-inch standard extruded satin anodized aluminum “J” channels manufactured by C.R. Lawrence Co., or equal.

B. Top Supporting Angles: “Catalog No. D645A” 1/4-inch deep nose extruded satin anodized aluminum “J” channels manufactured by C.R. Lawrence Co., or equal.

2.3 ACCESSORIES

A. Cut Edge Sealer: “CRL Gunther Seal-Kwik” manufactured by C.R. Lawrence Co., or equal.

B. Setting Blocks: “Catalog No. PSB040” clear plastic setting blocks manufactured by C.R. Lawrence Co., or equal.

C. Fasteners: Provide countersunk or flat head duplex anti-corrosive steel screw fasteners.

D. Mounting Adhesive Primer: “CRL Gunther Prime-N-Seal Primer” manufactured by C.R. Lawrence Co., or equal.

E. Mounting Adhesive: “CRL Gunther Ultra/Bond Mastic” manufactured by C.R. Lawrence Co., or equal.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install mirrored glass using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed mirrored glass must be warrantable. Do not install, correct, or replace mirrored glass in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach mirrored glass to supporting construction.

C. Installation Tolerances: Install mirrored glass to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible mirrored glass surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed mirrored glass in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed mirrored glass unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed mirrored glass as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 09

FINISHES

SECTION 09 0516
PREPARATION OF CONCRETE SUBSTRATES FOR FINISH FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete substrate testing equipment.
   2. Corrective (remedial) MVECS.
   3. Surface preparation.
   4. Site tests and inspections.
   5. Supplementary components, accessories, and detail work normally furnished or otherwise necessary for complete testing and preparation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 03 54 16 for definition of the term “underlayment”.
   2. Section 09 29 00 for definition of “permanent enclosure”.

1.2 RELATED DOCUMENTS

A. This specification section
   1. supplements the requirements of specification sections that identify penetrants, overlays, and coverings required for the project; and
   2. is used with other specification sections to produce correct and complete substrates for all actual in-service flooring conditions applicable to the project; and sound substrates for the proper and warrantable installation of all specified or selected penetrants, overlays, and coverings, including underlayment specified in Section 03 54 16.

1.3 PRICE AND PAYMENT PROCEDURES

A. Slab Remediation:
   1. Without reimbursement from Owner, perform or arrange and pay costs for performing all remedial work necessary to correct and improve
      a. defective flatwork, including areas that exceed the MVER, pH, and RH limits required, recommended, or accepted by the penetrant, overlay, and covering manufacturers; and
      b. penetrant, overlay, and covering failures resulting from selected concrete curing methods; and coordination of, or failure to coordinate, the chemical and adhesive compatibility of selected curing compounds with all subsequent penetrants, overlays, and

B. Definitions:

1. Floor Preparation: Means to make flatwork surfaces ready to receive finish flooring and suitable for proper bonding of flooring and installation materials, including patching minor holes and saw cuts, sanding, sweeping, and cleaning of conforming substrates.
2. Floor Repair: Means to fix or mend non-conforming substrates suffering from damage or fault, including grinding, filling, topping, and leveling activities.
3. Moisture Vapor Emission Rate (MVER): Means the amount of moisture emitted from a substrate, expressed as the weight of condensed gas (liquid) in theoretical pounds emitted over 1,000 square feet of floor area during a 24-hour period. MVER is commonly referred to as “pounds” (i.e., “3 pounds” or “3 lb”). Rates range from 0 to 30 pounds per 1,000 square feet per 24 hours.
4. Substrate: Means a recently-cured, hardened, newly-aged, or existing concrete substrate, including cast-in-place, sitecast, and precast concrete floor and deck assemblies, cast underlayment, toppings, repair materials, and similar items.
   a. Floor: Means a slab-on-grade floor assembly.
   b. Deck: Means a suspended floor or roof slab assembly.
5. Penetrant: Means any direct-applied material, product, component, accessory, or other item that can pass into or through substrate surfaces, or enter and diffuse through substrate surface cracks, pores, and other surface defects. Penetrants include water, hardeners, curing compounds, stains, penetrating repellents and sealers, non-sacrificial graffiti-resistant materials, and dry penetrants.
6. Overlay: Means any direct-applied film-forming or high-build material that covers a substrate surface, including cast decks, underlayment, and toppings; dampproofing, waterproofing, and roofing; liquid flashings and sealants; fluid-applied and flooring treatment; terrazzo flooring; and paints, coatings, and film-forming sealers; and sacrificial graffiti-resistant materials.
7. Covering: Means any direct-applied material, product, component, accessory, or other item that is adhered or bonded to a substrate surface, including tile and adhered veneer assemblies; specialty, masonry, wood, resilient and precast terrazzo flooring; carpeting; and unit paving.

8. Cladding: Means any material, product, component, accessory, or other item supported by a framework, which is attached to a sporting construction, including anchored veneer, wall and soffit panels, and exterior plaster assemblies; suspended ceiling assemblies; and free-standing elevated accessible floor and roof paver assemblies.
9. Overburden: Means all materials, components, accessories, and other items installed or placed over a cured substrate, including overlays, coverings, cladding, and vegetated plaza deck and roof assemblies.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. MVECS manufacturer's representative and MVECS installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, penetrant, overlay and covering manufacturers' representatives and installers, the MVECS manufacturer's representative and installer, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review
   a. substrate design and installation, including concrete mix design, water-cement ratio, slab thickness at each test location, below grade VDRs and concrete placement and pour dates;
   b. curing, sealing, or bond breaking compounds used on substrates, along with requirements and techniques used for complete removal of compounds prior to testing and floor covering installation;
   c. trenching, including mix design, water-cement ratio, thickness, and pour dates of concrete or slurry backfill;
   d. bonding agents selected for overlay installation or application;
   e. primers and adhesives selected for covering installation;
   f. qualifications of the testing agency and testing agency personnel that are scheduled to complete testing, and that interpret test results;
   g. calibration and verification of test equipment prior to beginning each round of testing;
   h. HVAC system operation and requirements during testing, including temperature and RH limits;
   i. preparation of testing sites, including procedures to assure slab surfaces are free from any material or substance that may hinder the free release of moisture from the slab;
   j. testing procedures and sequence for each test, including sequence, frequency, and location of test sites;

k. requirements for testing and inspection reports;
l. the construction schedule;
m. temporary procedures required to protect concrete surfaces from re-wetting after initial testing; and
n. redistribution of moisture within the substrate after floor coverings are applied;

5. Identify and discuss adverse or unfavorable conditions detrimental to testing and floor preparation.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

B. Quality Standards:
1. Quality Guideline: Selected concrete surface profiling, preparation, cleaning, and repair must conform to the requirements of International Concrete Repair Institute (ICRI) Guideline No. 310.2R, "*Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair*".
2. Installation Standard: Concrete surface preparation must conform to the requirements of Journal of Protective Coatings and Linings (JPCL) publication, "*Surface Preparation of Concrete Substrates*".

C. Qualifications:
1. Substrate Testing: Individuals performing substrate testing must be certified as ICRI Concrete Slab Moisture Testing Technicians, Grade 1 and current in their certification.
2. Substrate Repair: Individuals performing substrate repair must be certified as ICRI Concrete Surface Repair Technicians, Grade 1 and current in their certification.

D. Sequencing: Begin substrate testing only after
1. the building is enclosed with a permanent enclosure, including permanently-installed doors, windows, storefronts, curtain walls and similar opening protectives;
2. "wet work" such as concrete work, plastering, tile installation, and gypsum board finishing are complete and cured and dried to a condition of equilibrium;
3. testing areas are properly prepared for testing; and
4. the HVAC system is activated, operating, and maintaining temperatures and RH at anticipated occupancy levels for at least 48 hours prior to and during testing.
   a. If HVAC activation and operation prior to testing cannot be provided within the proposed construction schedule, then close a

number of rooms or spaces where conditions can either be brought to anticipated normal conditions or into conformance with the minimum environmental parameters of the specified test standards using commercial equipment and building climate control services.

b. Provide a recording hygrometer to monitor and record ambient temperature and RH levels for comparison to design occupancy conditions.

E. Scheduling:

1. Allow sufficient time in the construction schedule to permit concrete to cure and dry, without being re-wetted, for at least 90 days before beginning testing. Substrates re-wetted after initial curing must be permitted to cure and dry for at least 180 days before beginning testing.

a. If minimum concrete curing and drying time cannot be provided in the construction schedule, assume the specified MVECS must be incorporated into the project as a topical remediation for concrete substrates, and reflect this assumption in the project cost until otherwise directed by the Owner**.**

b. Forced drying substrates is prohibited.

2. Allow sufficient time in the construction schedule to permit RH test sites to equalize for at least 72 hours prior to reading equilibrium RH levels.

3. Testing must be complete and reports submitted at least one week, but not more than 3 weeks, before beginning penetrant, overlay, or covering installation or application.

1.6 SUBMITTALS

A. Action Submittals: Before beginning the work of this specification section, including bulk purchase and delivery of products, submit to the Architect the following for responsive action (formal review and approval).

1. Product Data:

a. Submit a comprehensive and complete list of proposed and other items specified, required, or otherwise necessary to complete the work of this specification section, including all accessories and similar secondary items normally furnished, required, or otherwise necessary for complete repair, surface preparation, testing, and remediation.

b. For each item listed, submit manufacturer’s product data, specifications, typical installation details for all actual in-service conditions applicable to this project, and any other information necessary to demonstrate conformance with the Contract Documents, excluding Material Safety Data Sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review.

B. Informational Submittals: Submit to the Architect the following for information (for informal review: responsive action by the Architect, including formal review and approval, is not expected or required, except to record non-conformance with specified requirements).

1. Installation Instructions: Before beginning the work of this specification section, submit the following.
   a. Submit manufacturer-prepared published instructions for the proper installation of each furnished manufactured item and accessory, including packaging, delivery, storage, handling, surface preparation, installation, adjusting, cleaning, and protection instructions and requirements.
   b. If manufacturer-prepared published installation instructions are either unavailable or do not specifically apply to actual project conditions, then consult with the manufacturer's representative and obtain manufacturer-prepared, project-specific supplemental instructions printed on the manufacturer's company letterhead. Promptly distribute copies to the Architect for examination before beginning the work of this specification section; the Architect may have comments that lead to contract modifications, or to minor changes in the work.
2. Test Reports: Submit facility floor plan diagrams showing area calculations and locations of each test along with measured test results for each test location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. American Moisture Test, Inc.
2. Vaisala
3. Wagner Electronics.

2.2 CONCRETE SUBSTRATE TESTING EQUIPMENT

A. Description: Commercially produced and -packaged test kits and equipment delivered to testing sites in factory-sealed wrappings.

B. MVER Testing Kits (CC Moisture Test Kits):

1. Description: ASTM F 1869-compliant anhydrous calcium chloride moisture vapor testing kits consisting of a sealed dish of anhydrous calcium chloride, a metering dome with gasket, and instructions.
2. Product: “AMT Calcium Chloride Moisture Test Kit” manufactured by American Moisture Test, Inc., or equal.
3. Components:
   a. Non-pre-weighed, non-recycled, 94-percent pure anhydrous calcium chloride sealed in air-tight dishes.
   b. Virgin resin non-recycled plastic dome having a maximum U.S. perm rating of 0.10-perm or less.
   c. Butyl adhesive sealant system.
   d. Dish container size of 69mm plus or minus one millimeter; calcium chloride weight of 16 grams plus or minus one gram.

C. pH Testing Kits:

1. Description: ASTM F 710-compliant digital alkalinity-pH meter.
2. Product: “AMT Concrete Digital Alkalinity-pH Meter” manufactured by American Moisture Test, Inc., or equal.
3. Components:
   a. Meter must return wide range (1-14) pH readings.
   b. Provide clean distilled or deionized water.

D. RH Testing Equipment:

1. Description: ASTM F 2170-compliant temperature and RH meter, cable, RH probes, and concrete sleeves.
2. Product: “AMT RH System” manufactured by American Moisture Test, Inc., or equal.

2.3 CORRECTIVE (REMEDIAL) MVECS

A. Description: Corrective MVER remediation system consisting of concrete mechanical surface profiling, sealer, and cementitious covering.

B. Application: MVER remediation system are applied when test results indicate slab MVER, pH, or RH exceed selected coating or covering manufacturer’s required, recommended, or accepted limits.

C. Concrete Surface Profiling: ICRI concrete surface profile CSP 2 to CSP 3 (grind to light blast between 4 and 10 mils), unless otherwise explicitly required, recommended, accepted in writing by the sealer manufacturer.

D. Sealer:
   1. Description: Moisture seal applied to substrates as a topical remediation.
   2. Products: “MES 100” manufactured by Floor Seal Technology, Inc., or equal.
   3. Requisite Properties:
      a. Composition: Products may not contain latex, organic additives or chemistries that have a potential to either re-emulsify or support micro-organism growth.
      b. Growth Resistance: Product must not support the growth of mold, mildew or biological growth.
      c. Safety: Non-corrosive, non-toxic, and non-hazardous to installers.
      d. Water Pollution: Product must be a non-marine pollutant, and safe for natural water sources.
      e. Maximum VOC Material Content: Less than 100 grams per liter.
   4. Performance Requirements:
      a. Water Vapor Transmission: Products must bring emission rates of up to 20 pounds to within a range conforming to the flooring manufactures’ requirements, when measured in conformance with ASTM F 1869.
      b. Alkali Resistance: Tolerant to 14pH alkali exposure, when tested in conformance with ASTM D 1308 and ASTM F 710.
      c. Minimum Adhesion Strength: Between 370 and 500 pounds per square inch, when tested in conformance with ASTM D 4541.
      d. Adhesive Compatibility: Complete compatibility with all covering primers, adhesive, and materials.
      e. Minimum RH Tolerance: Tolerant to at least 95 percent RH exposure, when determined in conformance with ASTM F 2170.

E. Covering:
   1. Description: Cementitious topping applied directly over sealer to provide smooth substrate for finish flooring.
   2. Products: Hydraulic cement underlayment specified in Section 03 54 16.
   3. Minimum Thickness: Install underlayment to thickness required by either the sealer manufacturer or the finish flooring manufacturer (whichever is thicker), but not less than 1/8-inch.

2.4 ACCESSORIES

A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16 unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Other Accessories: Provide accessories and other similar secondary items supplied, required, recommended, or accepted by the MVECS manufacturer.

2.5 SURFACE PREPARATION

A. Penetrants:

1. Remove all dirt, dust, debris, and other foreign matter from concrete surfaces

B. Marker Removal:

1. Remove all slab markings by sanding or bead blasting surface clean.
2. Completely remove all marker markings (i.e. Sharpie markers), marker paint, spray paint, and other markings.

C. Floor Coatings and Fluid-Applied Flooring:

1. Provide one or more of the following ICRI concrete surface profiles, as applicable, unless otherwise explicitly required, recommended, or accepted in writing by the flooring manufacturer.
   a. Sealers: CSP 1 to CSP 2. (grind to between 0 and 3 mils)
   b. Thin-Film Coatings: CSP 2 to CSP 3. (grind to light blast between 4 and 10 mils)
   c. High-Build Coatings and Resurfacing Applications: CSP 3 to CSP 5. (light to medium shotblast between 10 and 40 mils)
   d. Self-Leveling Overlays: CSP 4 to CSP 6. (medium to heavy shotblast between 50 mils and 1/8-inch)
   e. Polymer Overlays: CSP 5 to CSP 9. (medium shotblast to coarse planing between 1/8- and 1/4- inch)
   f. Concrete Overlays, Toppings, and Repairs: CSP 5 to CSP 10. (medium shotblast to coarse planing greater than 1/4- inch)
2. To reduce the risk of introducing microcracking into the substrate, all concrete surface profiling must be achieved through abrasive blasting, grinding, or shot blasting; or through the use of surface retarders.
   a. Handheld concrete breakers, rotomilling, needle scaling, scabbling, and scarifying are prohibited, unless explicitly required or recommended in writing by the covering manufacturer (scarifying grooves/lines may become visible through a newly laid coverings).
   b. Ultra-high- and high-pressure water jetting, and low-pressure water jetting surface preparation methods are also prohibited.
   c. Chemical cleaning and acid etching are also prohibited. (residual chemicals not removed may adversely affect the flooring performance and adhesion – ASTM D 4262 covers procedures for determining the acidity or alkalinity of concrete surfaces prepared by chemical cleaning or etching prior to coating)

3. Repair damaged sub-floor. Produce a uniform and smooth substrate. Fill cracks, holes, depressions, and similar substrate defects with trowelable leveling and patching compound; remove bumps and ridges.
4. Sweep and vacuum-clean substrates just prior to beginning floor covering installation.
5. Move floor coverings and installation materials into spaces at least 48 before installation.

D. Floor Coverings: Prepare substrates in conformance with the requirements of ASTM F 710 and as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Verify substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives or that contain soap, wax, oil, or silicone; or that may negatively affect the quality of installation, durability, appearance, or performance of furnished flooring. Comply with the flooring manufacturers' instructions using manufacturer-recommended techniques and equipment. Do not use solvents.
3. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface. Prohibit traffic until patching compound is cured.
4. Repair damaged sub-floor. Produce a uniform and smooth substrate. Fill cracks, holes, depressions, and similar substrate defects with trowelable leveling and patching compound; remove bumps and ridges.
5. Sweep and vacuum-clean substrates just prior to beginning floor covering installation.
6. Do not install floor coverings until both they and the installation materials are acclimated to the same temperatures as the spaces into which they are installed. Move floor coverings and installation materials into spaces at least 48 before installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Before beginning testing, examine project conditions and field-verify measurements affecting the work of this specification section.

1. Examine substrates scheduled for testing, and other conditions under which such items are tested, including HVAC operation and building enclosure.
2. Verify that work performed as part of the work of other specification sections conforms to the testing equipment or testing kit manufacturer's requirements; and satisfies all other conditions relating to the quality of testing.

3.2 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. General: Include site tests and inspections as part of the work of this specification section. The Owner's testing and inspection agency performs tests and inspections.
   a. Schedule and arrange all tests and inspections.
   b. Coordinate all work and the final construction schedule with all tests and inspections.
   c. Coordinate tests and inspections with the work of other specification sections, and other specified, required, or necessary tests and inspections.
   d. Furnish all work, equipment, tools, facilities, personnel, and controls necessary for each test and inspection.
   e. Arrange tests and inspections by notifying the Owner, the testing and inspection agency, the installer, the manufacturer's representative, and the Architect at least 5 business days before work is ready for testing or inspection.
   f. Witness all site tests and inspections.
   g. Receive test and inspection reports and distribute to the installer and the manufacturer's representative.
   h. When tests and inspections reveal defective items, repair defective work to the satisfaction of the manufacturer's representative and Architect, and re-test and re-inspect work without reimbursement from Owner until all work passes tests and inspections.

2. Required Tests: Conduct the following tests on all concrete substrates prior to the installation of any flooring material or component regardless of substrate grade level or age.
   a. MVER Testing (Anhydrous Calcium Chloride Test): Conduct CC tests in conformance with ASTM F 1869.
      1) Test area environmental conditions must match that of the finished floor covering.
      2) Doors, windows, and roofing must be installed and the building temperature controlled to a finished building atmosphere.
      3) Do not perform tests when the interior building temperature is below 65 deg. F for 72 hours prior to and throughout the duration of testing.
      4) The minim required number of test kits is determined by the square footage of areas scheduled to receive finish flooring. Provide at least 3 test kits for the first 1,000 square feet, and at least one additional test kit for each additional 1,000 square feet or fraction thereof, with consideration given to separation of test areas.
      5) Time of exposure must be between 60 hours 72 hours.
      6) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
      7) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
      8) Unseal dish and expose test according to preprinted test kit instructions.
      9) After exposure time has elapsed, retrieve test dish re-seal and re-weigh according to the manufacturer's instructions.
      10) Moisture emission rates exceeding 3 pounds may affect coating or covering. Verify permissible RH levels with individual flooring manufacturers.
   b. Alkalinity (pH) Testing: Conduct pH test in conformance with ASTM F 710.
      1) Perform tests after abrasive removal of concrete surfaces.
      2) Place several drops of water on a clean portion of the substrate surface; form a puddle approximately one-inch in diameter. Allow the puddle to set for at least 60 seconds, and then insert the digital alkalinity-pH meter probe into the puddle. Allow the meter to calculate results for 15 seconds and record the meter readings.

3) Concrete substrates must test between pH 8.0 and 10.0 before flooring materials are installed; slabs may not exceed pH 10.0.
4) Readings exceeding pH 10.0 may affect coating or covering. Verify permissible pH levels with individual flooring manufacturers.

c. RH Probe Test: Conduct *in situ* RH probe testing in conformance with ASTM F 2170
1) Concrete floor slabs must be at the in-service temperature and the occupied air space above the slab must be at the in-service temperature and RH far at least 48 hours before taking RH measurements in the substrate.
2) Perform at least 3 tests for the first 1,000 square feet and at least one test for every additional 1,000 square feet or fraction thereof.
3) At below-grade substrates, choose testing locations within 3 feet of each exterior wall.
4) Drill probe holes 40 percent down into the slab for slabs drying from the top only; 20 percent into the slab for slabs drying from top and bottom.
5) Use a vacuum cleaner to remove dust from drilled holes, and allow at least 72 hours for holes to achieve moisture equilibrium within each hole before taking RH measurements.
6) After the 72-hour equilibrium period, insert probes and allow a 30-minute period for each probe to reach temperature equilibrium before measuring RH.
7) Use the RH probe to measure the ambient air temperature and RH above the slab in the vicinity of the hole.
8) RH readings exceeding 75 percent may affect coating or covering. Verify permissible RH levels with individual flooring manufacturers.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs, and re-inspection and re-testing costs, without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

END OF SECTION

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SECTION 09 2116
GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gypsum board shaft wall assemblies.
   2. Delegated design of shaft wall assemblies.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 40 00 for cold-formed metal framing, including manufactured (pre-engineered) headers and metal wall backings.
   2. Section 09 22 16 for lightgage metal framing.
   3. Section 09 29 00 for installation and joint treatment materials; and for fire-rated partition and smoke barrier identification and marking.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. BMT: Base Metal Thickness.
   2. MSG: Manufacturer's Standard Gage for Sheet Steel.
   3. HDG: Hot Dip Galvanized.

B. Definitions:
   1. Manufacturer: Means the shaft wall assembly manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. System Description:
   1. Description: Non-loadbearing gypsum wall partition assemblies consisting of steel framing members, gypsum liner panels friction-fit into shaft wall assemblies, and gypsum board panels applied to faces.
   2. Application: Installed vertically to enclose stairwell enclosures, elevator shafts, and other shafts; installed horizontally to enclose fire-resistive duct enclosures; and and installed elsewhere as indicated.

B. Coordination: Coordinate glass mat interior gypsum panel joint finishing with applied paint finishes.
   1. When a Level 4 finish is specified or required, a high-solids primer with at least 40-percent volume solids must be applied to a minimum dry film thickness of 1.7 to 1.8 mils.
   2. When gloss or semi-gloss paint is specified, or when located in a critical or severe lighting area, provide Level 5 finish.
   3. Apply finish coats in conformance with the paint manufacturer's instructions.
C. Delegated Design Requirements:
   1. Where engineering is required, including when manufacturer's loading tables are exceeded, engineer, fabricate, assemble, and install shaft wall assemblies that conform to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, non-corroding, and weathertight assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
   2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.
D. Performance Requirements:
   1. Interior Partition Uniformly Distributed Lateral Live Load: At least 10 pounds per square foot.
   2. Design Loads: Shaft wall assemblies must also accommodate, resist, distribute, or transfer, as applicable, other loads to which they are subjected, including attachment of any architectural components, non-structural components, equipment, and similar items.
   3. Superstructure Displacement:
      a. Vertical Displacement of Adjacent Stories (Live Load Deflection): Allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.
      b. Horizontal Displacement of Adjacent Stories (Interstory Drift): Accommodate design displacement of adjacent stories indicated on the structural drawings and general notes.
   4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.

5. Perpendicular Deflection (Convexity and Concavity): Framing members may not deflect more than shown in California Building Code Table 1604A.3 or the following, whichever is less, measured normal to the assembly plane. Limit asymmetric wall construction deflection to the most stringent requirement that applies to the assembly.
    a. Construction Supporting Masonry: Not more than L/360.
    b. Construction Supporting Stone: Not more than L/960.
    c. Construction Supporting Plaster: Not more than L/360.
    d. Construction Supporting Gypsum Board: Not more than L/240.
    e. Construction Supporting Tile: Not more than L/360.
    f. Elevator Shaft Walls: Not more than L/240.
    g. Horizontal Shaft Walls: Not more than L/240.

E. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide items within the assembly that are identical to or better than those products indicated as listed and tested in conformance with ASTM E 90 and ATM E 413.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
    1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
    2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
    1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished shaft wall assemblies.
        a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
        b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
    a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
    b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
    c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:
    1. Shaft wall assemblies must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
        a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
        b. Items provided for each different installation must be obtained from the same source and manufacturer.
    2. Gypsum panel products must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
        a. Panel products may not be manufactured outside of North America by a domestic company.
        b. Panel products may not be manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company.
    3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Comply with all requirements of the California Building Code (CBC).
2. Comply with ASTM C 754 requirements for installation of lightgage metal framing, except conform to the framing sizes and spacing indicated.
3. Comply with the requirements of ASTM C 840 that apply to framing installation

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing shaft wall assemblies for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing shaft wall assemblies for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading shaft wall assemblies.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective shaft wall materials with undamaged new shaft wall materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. CertainTeed Corp.
2. GP Building Products.
3. National Gypsum Co.
4. USG Corp.

2.2 STEEL FRAMING

A. Materials: HDG Metallic-coated steel sheet for lightgage framing conforming to ASTM C 645 and manufactured from HDG metallic-coated steel sheet conforming to ASTM A 1003, NS33 (Non-Structural Grade 33), with at least a G40 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface. Gage-equivalent drywall framing (G40e, G40EQ, and similar equivalent protective coatings) is prohibited.

B. Studs:

1. Description: Manufacturer's standard pre-punched CH-, CT-, and I-shaped framing.
2. Requisite Properties:
   a. Depth: Indicated on the Drawings.
   b. Minimum Thickness: At least 30 mils BMT (MSG 20).
   c. Flanges: At least 1-1/2-inch wide unstiffened flanges.

C. Jamb Studs:

1. Description: Manufacturer's standard pre-punched J-shaped framing.
2. Requisite Properties:
   a. Depth: Indicated on the Drawings.
   b. Minimum Thickness: At least 30 mils BMT (MSG 20).
   c. Flanges: At least 3-inch wide unstiffened flanges.

D. Runner Track:
   1. Description: Manufacturer's standard un-punched U-shaped framing.
   2. Requisite Properties:
      a. Depth: Indicated on the Drawings.
      b. Minimum Thickness: At least 30 mils BMT (MSG 20).
      c. Flanges: At least 2-inch wide unstiffened flanges.

E. Deflection Track:
   1. Description: Slotted roll- or brake-formed track installed in head-of-wall deflection conditions to accommodate vertical movement caused by normal head-of-wall and floor extension or compression.
   2. Products: "CEMCO Slotted Track (CST)" or "SLP-TRK" manufactured by CEMCO, or equal.

2.3 WALL PANELS

A. Gypsum Liner Panels:
   1. Description: Gypsum-based GMF commercial exterior sheathing conforming to ASTM C 1177.
   2. Products: Provide one of the following, or equal.
      a. "DensGlass Shaftliner" manufactured by GP Building Products.
      b. "eXP Shaftliner" manufactured by National Gypsum Co.
      c. "SHEETROCK Glass-Mat Liner Panels Mold Tough" manufactured by USG Corp.
   3. Requisite Properties:
      a. Size: Provide at least 2-foot by 8-foot sheets.
      b. Thickness: One inch.
      c. Edges: Double beveled.
      d. Facers: Heat-cured, acrylic-coated, fiberglass mat on the face side, back side, and around long edges. Water repellent face and backing papers are prohibited.

B. Gypsum Wall Panels:
   1. Description: Glass mat interior gypsum panels conforming to ASTM C 1658.
   2. Products: Provide one of the following, or equal.
      a. "DensArmor Plus Interior Panels" manufactured by GP Building Products.
      b. "e^2XP Interior Extreme" manufactured by National Gypsum Co.
      c. "SHEETROCK Glass-Mat Panels Mold Tough" manufactured by USG Corp.

3. Requisite Properties:
    a. Minimum Size: Provide at least 4-foot by 8-foot sheets.
    b. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
    c. Edges: Tapered long edges and square ends.
    d. Facers: Heat-cured, acrylic-coated, fiberglass mat on the face side, back side, and around long edges. Water repellent paper facers and backings are prohibited.

2.4 ACCESSORIES

A. Shims: Load bearing, non-leaching, high-density multimonomer plastic.

B. Fasteners: Provide #6-32 UNC 2B (0.138-inch shank diameter, 32 threads per inch) by at least 1-1/4-inch long, Philips bugle head, coarse thread, self- piercing or self-drilling (as applicable) phosphate coated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

C. Power-Actuated Fasteners:
    1. Description: ICC-ES-approved anchors conforming to California Building Code Category 1, Seismic Zones A-F.
    2. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.

D. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
    1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
    2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install shaft wall assemblies using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Installed shaft wall assemblies must be warrantable. Do not install, correct, or replace shaft wall assemblies in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Do not bridge architectural or building expansion joints with shaft wall assemblies; frame both sides of expansion joints separately.
2. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary shaft wall assemblies around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
3. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
4. Install control joints in conformance with ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
5. Install partitions with 1/4-inch maximum gaps between gypsum board and both abutting construction (floors, ceilings, and walls) and penetrations.
6. Seal gypsum board with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.
7. At elevator shafts where shaft wall assemblies cannot be positioned within 4 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, provide 1/2- or 5/8-inch- thick gypsum board cants covering tops of projections. No recesses allowed (at steel beams especially).
    a. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches O.C. with screws fastened to shaft-wall shaft wall assemblies.

b. Where shaft wall assemblies is required to support gypsum board cants, install shaft wall assemblies at 24 inches on center and extend studs from the projection to shaft-wall shaft wall assemblies.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach shaft wall assemblies to supporting construction.

D. Installation Tolerances: Install shaft wall assemblies within the following tolerance variations.

1. Maximum out of Plumb: Not more than L/960 of span, or 1/8-inch in 10 feet.
2. Maximum out of Level: Not more than L/960 of span, or 1/8-inch in 10 feet,
3. Maximum out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
4. Maximum Stud Spacing Variance: Not more than 1/8-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed shaft wall assemblies in place from deterioration and damage until Substantial Completion. Remove and replace wet, moisture-, or mold-damaged panels.

   1. Indications panels are wet or moisture damaged include discoloration, sagging, or irregular shape.

   2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

B. Do not store anything on, adjacent to, or against installed shaft wall assemblies unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed shaft wall assemblies as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 2216
LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal furring for supporting interior finish materials.
   2. Metal framing for supporting interior partition and ceiling assemblies.
   3. Delegated design of metal framing assemblies.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 40 00 for cold-formed metal framing, including manufactured (pre-engineered) headers and metal wall backings.
   2. Section 09 21 16 for gypsum shaft wall framing.
   3. Section 09 22 26 for metal suspension systems.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. BMT: Base Metal Thickness.msg
   2. MSG: Manufacturer’s Standard Gage for Sheet Steel.
   3. HDG: Hot Dip Galvanized.

B. Definitions:
   1. Manufacturer: Means the metal framing manufacturer, unless otherwise indicated.
   2. Metal Framing: Means lightgage metal framing.
   3. Gage: Means the thickness of sheet metal based on weight measured in pounds per square foot per inch of thickness. For the purposes of this specification, gages are classified the Table below. Minimum thickness indicated in the first column is equivalent to 95 percent of the design thickness and is the minimum acceptable thickness of base metal delivered to the project site.
   4. Manufacturers' Standard Gage for Sheet Metal: Means the steel sheet thickness based on a weight of 41.82 pounds per square foot per inch of thickness.
   5. Base Metal Thickness: Means the thickness of sheet steel material without any coatings.

6. Lightgage Metal Framing: Means metal framing members having a BMT of 30 mils BMT (MSG 20) or less and installed in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.
7. Cold-Formed Metal Framing: Means metal framing members having a BMT range of between 118 mils BMT (MSG 10) and 33 mils BMT (MSG 20) and installed in transverse or axial load-bearing applications, or in non-load bearing interior construction assemblies typically supporting plaster or gypsum board.

Lightgage Metal Framing specified in this specification Section		
25	18	0.0188
22	27	0.0283
20	30	0.0312
Cold-Formed Metal Framing specified in Section 05 40 00		
20	33	0.0346
18	43	0.0451
16	54	0.0566
14	68	0.0713
12	97	0.1017
10	118	0.1242

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Where engineering is required, including when manufacturer's loading tables are exceeded, engineer, fabricate, assemble, and install framing that conforms to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and results in structurally sound, and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Interior Partition Uniformly Distributed Lateral Live Load: At least 7.5 pounds per square foot.
2. Design Loads: Interior partitions must also accommodate, resist, distribute, or transfer, as applicable, other loads to which they are subjected, including attachment of any architectural components, non-structural components, equipment, and similar items.
3. Superstructure Displacement:
   a. Vertical Displacement of Adjacent Stories (Live Load Deflection): Allow for at least 3/4-inch vertical live load structure deflection, unless otherwise indicated on the structural drawings and general notes.
   b. Horizontal Displacement of Adjacent Stories (Interstory Drift): Accommodate design displacement of adjacent stories indicated on the structural drawings and general notes.
4. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.
5. Perpendicular Deflection (Convexity and Concavity): Framing members may not deflect more than shown in California Building Code Table 1604A.3 or the following, whichever is less, measured normal to the assembly plane. Limit asymmetric wall construction deflection to the most stringent requirement that applies to the assembly.
   a. Construction Supporting Masonry: Not more than L/360.
   b. Construction Supporting Stone: Not more than L/960.
   c. Construction Supporting Plaster: Not more than L/360.
   d. Construction Supporting Gypsum Board: Not more than L/240.
   e. Construction Supporting Tile: Not more than L/360.

C. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide items within the assembly that are identical to or better than those products indicated as listed and tested in conformance with ASTM E 90 and ATM E 413.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer’s product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing framing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished framing.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
   a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
   b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
   c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Framing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.

2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Comply with all requirements of the California Building Code (CBC).
2. Comply with ASTM C 754 requirements for installation of lightgage metal framing, except conform to the framing sizes and spacing indicated.
3. Comply with the requirements of ASTM C 840 that apply to framing installation

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing framing for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing framing for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading framing installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective framing with undamaged new framing that does not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. California Expanded Metal Products Co. (CEMCO)
2. Clarkwestern Dietrich Building Systems LLC.
3. Olmar Supply Inc.
4. SCAFCO Corp.

2.2 MATERIALS

A. Cold-Formed Metal Framing: ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

B. Lightgage Metal Framing: ASTM C 645 manufactured from HDG metallic-coated steel sheet conforming to ASTM A 1003, NS33 (Non-Structural Grade 33), with at least a G40 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COLD-FORMED METAL FURRING

A. Hat Furring Channels:
1. Products: "FC Series Furring Channel" manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
   a. Depth: 7/8- or 1-1/2-inch deep channels, as indicated.
   b. Minimum Thickness: At least 43 mils BMT (MSG 18).

c. Web: 1-1/4 inches wide.
d. Screw Flanges: 3/4-inch wide.

B. Z-shaped Furring Channels:
1. Products: “Z-Furring (ZF-Series)” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
a. Depth: One to 3 inches deep, as indicated.
b. Minimum Thickness: At least 43 mils BMT (MSG 18).
c. Screw Flanges: 1-1/4 inches wide.

2.4 LIGHTGAGE METAL FURRING

A. Hat Furring Channels:
1. Products: “Hat” or “F” furring channel manufactured by CEMCO, or equal.
2. Requisite Properties:
a. Depth: 7/8- or 1-1/2-inch deep, as indicated.
b. Minimum Thickness: At least 30 mils BMT (MSG 20).
c. Web: 1-1/4 inches wide or 2-1/2 inches.
d. Screw Flanges: 1/2-inch wide.

B. Z-shaped Furring Channels:
1. Products: “CEMCO Z - Furring Channel” manufactured by CEMCO, or equal.
2. Requisite Properties:
a. Depth: 7/8-inch.
b. Minimum Thickness: At least 30 mils BMT (MSG 20).
c. Screw Flanges: 1-1/4 inches wide.

C. Standard Resilient Channels:
1. Products: “RC1-X” manufactured by CEMCO, or equal.
2. Requisite Properties:
a. Depth: 1/2-inch deep.
b. Minimum Thickness: At least 30 mils BMT (MSG 20).
c. Screw Flanges: 1-1/4 inches wide.

D. Resilient Channels for Acoustical Applications:
1. Product: “RC Deluxe Resilient Channel (RCSD)” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.
2. Requisite Properties:
a. Depth: 1/2-inch deep.
b. Minimum Thickness: At least 27 mils BMT (MSG 22).
c. Screw Flanges: 1-1/2 inches wide.

E. Resilient Sound Isolation Clips:
   1. Description: Molded rubber and steel resilient sound isolation wall and ceiling clips.
   2. Products: Provide one of the following, or equal.
      a. “IsoMax” manufactured by Kinetics Noise Control, Inc.
      b. “RSIC-1” manufactured by PAC International, Inc.
      c. “GenieClip Resilient Sound Isolation Clip” manufactured by Pliteq, Inc.

2.5 LIGHTGAGE STUD FRAMING

A. Studs:
   1. Description: Pre-punched C-shaped framing members with manufacturer’s standard knockout sizing and spacing.
   2. Product: “Viper Stud” manufactured by CEMCO, or equal.
   3. Requisite Properties:
      a. Depth: Indicated on the Drawings.
      b. Minimum Thickness: At least 30 mils BMT (MSG 20).
      c. Flanges: 1-1/4-inch wide stiffened flanges with at least 1/4-inch returns (lip).
B. Tracks (Top and Bottom Runners):
   1. Description: Un-punched U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
   2. Product: “Viper Track” manufactured by CEMCO, or equal.
   3. Requisite Properties:
      a. Depth: Indicated on the Drawings.
      b. Minimum Thickness: At least 30 mils BMT (MSG 20).
      c. Flanges: At least 1-1/4-inch wide unstiffened flanges.
C. High-Performance Studs:
   1. Description: Pre-punched C-shaped framing members with manufacturer’s standard knockout sizing and spacing.
   2. Product: “Viper-X Stud” manufactured by CEMCO, or equal.
   3. Requisite Properties:
      a. Depth: Indicated on the Drawings.
      b. Minimum Thickness: At least 28 mils BMT.
      c. Flanges: 1-7/16-inch wide flanges with at least 3/8-inch returns (lip).

D. High-Performance Tracks (Top and Bottom Runners):
   1. Description: Un-punched U-shaped runners manufactured from the same material to corresponding stud sizes and gages.
   2. Product: “Viper-X Track” manufactured by CEMCO, or equal.
   3. Requisite Properties:
      a. Depth: Indicated on the Drawings.
      b. Minimum Thickness: At least 28 mils BMT.
      c. Flanges: At least 1-1/4-inch wide unstiffened flanges.
E. Deflection Tracks:
   1. Description: Slotted roll- or brake-formed track installed in head-of-wall deflection conditions to accommodate vertical movement caused by normal head-of-wall and floor extension or compression.
   2. Products: “CEMCO Slotted Track (CST)” or “SLP-TRK” manufactured by CEMCO, or equal.
F. Cold Rolled Channel (CRC) Bridging:
   1. Description: Un-punched U-shape stiffeners installed in both load-bearing and non-load bearing walls to help resist stud twisting.
   2. Requisite Properties:
      a. Size: 1-1/2-inch wide by 1/2-inch deep.
      b. Minimum Thickness: At least 54 mils BMT (MSG 16).
      c. Flanges: 1/2-inch wide unstiffened flanges.
   3. Manufactured Bridging Clips: “SUBH Wall Stud Bridging Connectors” manufactured by CEMCO, or equal.
G. Flat Strap Bridging (Strapping):
   1. Application: Flat sheet installed to provide resistance to stud rotation and minor axis buckling under loads for studs deeper than 6 inches.
   2. Requisite Properties:
      a. Width: Between 2 and 20 inches, as indicated or necessary.
      b. Minimum Thickness: At least 54 mils BMT (MSG 16).

2.6 SPECIALTY FRAMING

A. Corner Angles:
   1. Description: Utility angles installed as a connection strut or angle, as corner reinforcement, or other various framing applications.
   2. Requisite Properties:
      a. Minimum Thickness: At least 30 mils BMT (MSG 20).
      b. Legs: 2- or 3-inch wide legs, as indicated, unless a wider or uneven leg size is explicitly indicated; or is otherwise supplied, required, recommended, authorized, or accepted by the manufacturer.

2.7 ACCESSORIES

A. Partition Closures:

1. Description: Narrow resilient partition termination and sound deterrent manufactured from extruded Silicone conforming to ASTM D 2000, 4GE 709 M.
2. Application: Used at voids between partition ends and exterior curtain walls; must allow exterior glass deflection during positive and negative wind loading.
3. Product: “Rizza PCS” manufactured by Balco, Inc., or equal.
4. Color: ProductOptions indicated on the Drawings or selected by the Architect.

B. Fire-Rated Partition Closures:

1. Description: Narrow partition termination and sound deterrent manufactured from dual-sided silicone sealing surfaces adhered to fire-retardant impregnated foam backing.
2. Application: Used at voids requiring a fire-resistance rating between partition ends and exterior curtain walls; must allow exterior glass deflection during positive and negative wind loading.
3. Product: “WFR2” manufactured by EMSEAL, or equal.
4. Color: ProductOptions indicated on the Drawings or selected by the Architect.

C. Mullion Closures:

1. Description: Factory-assembled, spring loaded, pre-finished aluminum adjustable partition closure.
2. Application: Used at voids between partition ends and exterior storefront or curtain wall mullions.
3. Product: “Mullion Mate” manufactured by Gordon, Inc., or equal.
4. Color: Match curtain wall mullions.

D. Decoupling Sound Isolation Clips: “RSIC-DC04” manufactured by PAC International, LLC, or equal.

E. Resilient Channel Vibration Isolation Clip: “Cylent Assurance Clip” manufactured by Keene Building Products, Inc., or equal.

F. Resilient Partition Isolation Pad:

1. Description: Molded fiber glass board.
2. Application: Used to decouples sound-rated partitions from non-isolated structure.

3. Product: “Wallmat” stud wall isolation strip manufactured by Kinetics Noise Control, Inc., or equal.
4. Accories: “KAI” isolation bushing assemblies manufactured by Kinetics Noise Control, Inc., or equal.

G. Low Partition Wall Floor Anchors: “Floor Anchor” stud reinforcement manufactured by Pinquist Tool & Die Co., Inc., or equal.

H. Steel Beam and Column Wallboard Clips: “The Claw” beam clips manufactured by Claw International, or equal.

I. Shims: Load bearing, non-leaching, high-density multimonomer plastic.

J. Screw Fasteners: Provide #8-32 UNC 2B (0.164-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-piercing or self-drilling as applicable, chromate finish zinc-plated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

K. Power-Actuated Fasteners:
1. Description: ICC-ES-approved anchors conforming to California Building Code Occupancy Category III, Seismic Design Category E, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.
2. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.

L. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

M. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install framing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Installed framing must be warrantable. Do not install, correct, or replace framing in a manner that results in any warranty or guarantee becoming void.

B. Metal Furring Special Techniques:

1. Direct Furring: Attach to concrete or to masonry with stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
2. Z-Furring:
   a. Except at outside corners, securely attach narrow flanges of furring members to walls with concrete stub nails, screws designed for masonry attachment, or power-actuated fasteners spaced 24 inches on center.
   b. At outside corners, attach wide flange of furring members to walls with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

C. Metal Framing Special Techniques:

1. Align and securely attach floor and ceiling tracks to superstructure.
2. Install studs in single lengths extending from floor to underside of floor or roof structure above without joints, except where indicated on the Drawings as stopping at or above ceilings. Stud splicing is prohibited without prior written authorization from the Architect.
   a. Install studs so that flanges within framing systems point in same direction.
   b. Continue framing around ducts that penetrate partitions above ceilings.
   c. Where framing extends to overhead structural supports, install vertical deflection connectors to produce joints at tops of framing assemblies that prevent axial loading of finished assemblies.

d. Where studs stop at or above ceilings, brace not more than every fourth stud with opposite-side bracing installed at 45-degree angles and securely fastened to the underside of the floor or roof structure above.
e. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
f. Assemble corners using at least 3 studs.

3. Unless otherwise indicated, provide screw attachment to tracks for
   a. studs with gypsum board on only one side;
   b. studs on each side of doors and windows;
   c. studs supporting wall hung plumbing fixtures; and
   d. studs supporting wall hung urinal screens, toilet compartments, cabinets, equipment, and similar items.
4. Attach all other studs to tracks either by friction fit for single stud gypsum board partitions or by attaching with screws in conformance with the manufacturer's published installation instructions.
   a. Space anchors within 6 inches of ends of each track segment ends, and not more than 24 inches on center.
   b. Do not install fasteners within 3 inches of slab or curb edges.
5. Where required by engineering calculations, install horizontal bridging spaced not more than 54 inches on center. Unless otherwise indicated, provide bridging in partitions supporting wall supported cabinets.
   a. Provide an additional 3/4 inch channel 6 inches above door headers, and extend at least 3 studs beyond the jamb studs.
   b. Install channels in longest possible lengths. At end joints, lap at least 12 inches and wire-tie. Do not tie together channels on opposite sides of staggered or double stud partitions.

D. Door and Window Opening Special Techniques:
1. Provide double studs (installed face to face to form a tube) at locations adjacent to doors and openings.
2. Extend studs at door openings to slab or deck above and securely anchor both to bottom track and to top slab or deck.
3. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
4. Install sections of track over door and window frames with clip angles securely attached at each end to adjacent vertical studs. Install cut-to-length studs at vertical joint locations; and at standard spacing over the door frame header extending to the ceiling track.
5. Install cripple studs at opening heads adjacent to each jamb stud, with at least a 1/2 inch clearance from the jamb stud to allow for installation of control joint in the finished assembly.

E. Other Opening Special Techniques: Unless otherwise indicated, frame other openings and recesses in stud walls the same as that required for door openings.
   1. Install framing below sills matching framing required above door heads.
   2. Provide additional framing as required for the secure attachment of electrical boxes, fire extinguisher cabinets, and similar items located in stud walls.
F. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach framing to supporting construction.
G. Installation Tolerances: Install framing within the following tolerance variations.
   1. Maximum Out of Plumb: Not more than L/960 of span, or 1/8-inch in 10 feet.
   2. Maximum Out of Level: Not more than L/960 of span, or 1/8-inch in 10 feet,
   3. Maximum Out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
   4. Maximum Stud Spacing Variance: Not more than 1/8-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 09 2226
METAL SUSPENSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal furring and framing systems for supporting suspended gypsum board ceilings.
2. Delegated design of metal furring and framing assemblies.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. BMT: Base Metal Thickness.msg
2. MSG: Manufacturer's Standard Gage for Sheet Steel.
3. HDG: Hot Dip Galvanized.

B. Definitions:

1. Manufacturer: Means the metal suspension system manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Delegated Design Requirements:

1. Where engineering is required, including when manufacturer's loading tables are exceeded, engineer, fabricate, assemble, and install suspension systems that conform to the profiles indicated and other Contract Document requirements; meet specified performance criteria; and result in structurally sound, and non-corroding assemblies that accommodate, resist, distribute, or transfer in-service loads without incipient or catastrophic failure.
2. Maintain visual design concept indicated, including sizes, profiles, and alignments. Deviation from visual design concept is non-conforming work and prohibited without prior written acceptance by the Architect.

B. Performance Requirements:

1. Superstructure Deflection and Story Drift: Accommodate design displacement of adjacent stories indicated on the structural drawings.

2. Seismic Loads: Resist, distribute, or transfer seismic loads indicated on the structural drawings without incipient or catastrophic failure.
3. Perpendicular Deflection (Convexity and Concavity): Drywall support system may not deflect more than L/240, measured normal to the assembly plane.

C. Acoustic Requirements: Where materials are part of an STC-rated assembly, provide items within the assembly that are identical to or better than those products indicated as listed and tested in conformance with ASTM E 90 and ATM E 413.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Delegated Design Submittals: Together with shop drawings, submit engineering calculations demonstrating conformance to the Contract Documents and all impacts of delegated design scope of work on other work.
      a. Calculations must be explicit and legible and must incorporate distinct cross-references to submitted shop drawings in sufficient quantity to render the calculations readily intelligible and reviewable.
      b. At a minimum, calculations must include design loads; analysis of supporting construction, including section-property computations; analysis of fasteners, anchors, attachments, and connectors; and signature and seal of the licensed professional engineer responsible for preparing them.
      c. Test reports are not an acceptable substitute for calculations and are returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Suspension system components must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Comply with all requirements of the California Building Code (CBC).

C. Qualifications:

1. Installer: Company or individuals must have experience installing suspension systems projects similar to this project in size, material, design, and complexity.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.

2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to other sources of deterioration and damage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective suspension system components with undamaged new suspension system components that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
1. California Expanded Metal Products Co. (CEMCO)
2. ClarkDietrich Building Systems.
3. Olmar Supply Inc.
4. SCAFCO Corp.

2.2 MATERIALS

A. Cold-Formed Metal Framing: ASTM A 1003, ST50 (Structural Grade 50), with at least a G60 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

B. Lightgage Metal Framing: ASTM C 645 manufactured from HDG metallic-coated steel sheet conforming to ASTM A 1003, NS33 (Non-Structural Grade 33), with at least a G40 coating weight designation (mass designation) on both surfaces with equal coating weight on each surface.

2.3 COMPONENTS

A. Galvanized Carbon Steel Wire:
   1. Hanger Wire: At least 0.162-inch diameter (SWG 8).
   2. Diagonal Bracing Wire: At least 0.106-inch diameter (SWG 12).
   3. Tie Wire: At least 0.050-inch diameter (SWG 18).

B. Standard Furring Clips:
   1. Application: Used in lieu of tie wire to attach metal furring channels to 1-1/2-inch U-channels in drop ceiling assemblies.
   2. Restrictions:
      a. Clips must be installed on alternating sides of carrying channels. Use tie wire when clips cannot be alternated.
      b. Clips must only be used when single-layer gypsum or single-layer veneer plaster base is used. Otherwise use tie wire.
   3. Product: “Metal Furring Channel Clips (MFCC)” manufactured by Clarkwestern Dietrich Building Systems LLC, or equal.

C. Resilient Sound Isolation Furring Clips:
   1. Application: Used in lieu of tie wire to attach metal furring channels to 1-1/2-inch U-channels in drop ceiling assemblies.
   2. Restrictions:
      a. Clips must be installed on alternating sides of the 1-1/2-inch channels. Use tie wire when clips cannot be alternated.
      b. Clips must only be used when single-layer gypsum or single-layer veneer plaster base is used. Otherwise use tie wire.
      c. Carrying channels (U-channels) may not exceed 48-inch on center spacing.
      d. Furring channels (hat channel) may not exceed 24-inch on center spacing.
   3. Product: “GenieClip C3” manufactured by Pliteq Inc., or equal.

D. Flat Hangers (Straps):
   1. Width: At least 2 inches.
   2. Minimum Thickness: At least 97 mils BMT (MSG 12).

E. U-Channel or Cold Rolled Channel (CRC) Carrying Channels:
   1. Deep: 3/4- or 1-1/2-inches.
   2. Minimum Thickness: At least 97 mils BMT (MSG 12).
   3. Flanges: 1/2 inch wide.

F. Hat Furring Channels:
   1. Products: “Hat” or “F” furring channel manufactured by CEMCO, or equal.
   2. Depth: 7/8- or 1-1/2-inch deep, as indicated.
   3. Minimum Thickness: At least 30 mils BMT (MSG 20).
   4. Web: 1-1/4 inches wide or 2-1/2 inches.
   5. Screw Flanges: 1/2-inch wide.

2.4 ACCESSORIES

A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.

B. Seismic Separation Joints: Provide seismic separation joints at ceiling locations where the contiguous area of non-broken ceiling is 2,500 square feet or greater.

C. Compression Struts:
   1. Cold or hot rolled angles, loadbearing or non-loadbearing studs, EMT or rigid conduit, or black iron.
   2. Cold-rolled steel section with maximum L/R ratio of 200.

D. Screw Fasteners: Provide #8-32 UNC 2B (0.164-inch shank diameter, 32 threads per inch) by at least one-inch long, pan head, coarse thread, self-piercing or self-drilling as applicable, chromate finish zinc-plated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

E. Power-Actuated Fasteners:
   1. Description: ICC-ES-approved anchors conforming to California Building Code Occupancy Category III, Seismic Design Category E, unless a more stringent Occupancy Category or Seismic Design Category is indicated on the Structural Drawings.

A. Manufacturer: Provide products manufactured by Hilti, Inc., or equal.

F. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

G. Other Accessories: Provide other accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install suspension systems using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Installed suspension systems must be warrantable. Do not install, correct, or replace suspension systems in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach suspension systems to supporting construction.

C. Installation Tolerances: Install suspension systems within the following tolerance variations.

1. Maximum Out of Plane: Surfaces may not vary by more than 1/8-inch in 10 feet.
2. Carrying Channel Maximum Out of Level: Not more than 1/8-inch in 12 feet,
3. Main Runner Maximum Out of Level: Not more than 1/4-inch in 10 feet,
4. Main Runner Maximum Deflection: Not more than L/360 of span,
5. Maximum Misalignment of Main Runners: 0.015-inch.
6. Maximum Misalignment of Intersection Members: 0.020-inch.
7. Main Runner Bow, Camber, and Twist: Not more than 1/32-inch in 2 feet bow or camber; not more than one degree twist.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 09 2423
PORTLAND CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Supporting framework.
   2. Cementitious scratch and brown coats.
   3. Portland cement plaster finish.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 07 25 13 for sheet weather-resistive barriers.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AR: Alkali Resistant.

B. Definitions:
   1. Manufacturer: Means the plaster manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:
   1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
   2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation
   3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed plaster. Resolve each condition.
   4. Finalize construction schedule.
   5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples: Submit at least 18-inch square representative color stepped samples of each plaster type, color, finish with typical trim and joints intersecting at the center of each sample. Stepped samples must include each coat or layer, including prime coat, separately identified by manufacturer's name, and product name or stock number.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished plaster.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Plaster must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Qualifications:*(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing plaster for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing plaster for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading plaster installers.

C. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate plaster into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped and in conformance with manufacturer's instructions and other requirements and recommendations for storage. Furnish adequate dunnage during storage.

1. Prevent stored items from contacting the floor or ground and from deterioration and damage.
2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)

3. Incline covered items to ensure maximum drainage of accumulated moisture.
4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage, including heat and sudden changes in temperature, and UV exposure beyond manufacturer-recommended limits.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective plastering materials with undamaged new plastering materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install plaster only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Other Conditions:
   1. Substrate Tolerance: Surfaces receiving plaster finishes must be flat with 1/4-inch within any 10-foot radius.
   2. Deflection: Maximum of substrate deflection under positive or negative design loads must not exceed L/360 of span.

1.8 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for the work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 SUPPORTING FRAMEWORK

A. Heavy-Duty Welded Wire Lath:

1. Description: Self-furring galvanized steel welded wire fabric lath fabricated in conformance with the requirements of ASTM C 847, ASTM C 933, ASTM C1032, ASTM C1063 and Appendix.
2. Application: Fabricated for use as an alternative to 2.5 or 3.4 pound per square yard diamond mesh metal lath specified in ASTM C 847 and as an alternative to 1.4 pound per square yard woven wire lath specified in ASTM C 1032.
3. Product: “Mega Lath” manufactured by Structa Wire Corp. (ICC-ES Report No. ESR-2017), or equal.
4. Requisite Properties:
   a. Minimum Size: 30 inches wide by 108-foot long rolls. (30 square yards)
   b. Wire and Mesh Sizes: 17-gage galvanized steel wire welded to form 0.7-inch by 1.5-inch openings.
   c. Nominal Weight: 1.95 pounds per square yard.
   d. Style: Self-furring.
   e. Minimum Groove Depth: At least 1/4-inch.

B. Galvanized Steel Trim:

1. Description: Zinc coated (HDG) steel trim conforming to ASTM C 847, ASTM C 933, ASTM C1032, ASTM C1063 and Appendix.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
   a. California Expanded Metal Products Co. (CEMCO)
   b. Clarkwestern Dietrich Building Systems LLC.
   c. Fry Reglet.
   d. Stockton Products.
3. Products: “Water Management Products” manufactured by California Expanded Metals Co. (CEMCO), or equal.
   a. Foundation Weep Screeds: “#7 Foundation Sill Screed (FHA Screed)”, or equal, with at least a 3-1/2-inch flange and weep holes.
   b. Extended Weep Screed: “#7 Extended Foundation Screed”, or equal, one-piece flashing weep screed for applications at decks were flashing is needed to protect waterproof membrane.
   c. Base Flashing: “#17 Base Flashing”, or equal, one-piece flashing weep screed for applications at decks were flashing is needed to protect waterproof membrane.

d. Drip Head: “#6 Drip Head”, or equal, for application above vents, doors, windows, joints, and as indicated on the Drawing; water can weep out of the slope leg and solid return leg used for sealant application.
e. Drip Edge: “#12 Soffit Drip Edge”, or equal, used at soffits and recessed windows; provides drainage and drip edge.
f. Flashing Screed: “#3 Flashing Screed”, or equal, one-piece Z-flashing and weep screed combination for application at window head.
g. Casing Beads: “J-Series Casing Bead”, or equal, non-perforated casing bead; used as a stop to terminate plaster edge in a clear straight line at head of plaster or jamb conditions of doors, windows.
h. Expansion Joints: “M-SLIDE EXPANSION JOINT”, or equal; 2-piece plaster accessories are prohibited.
i. Horizontal Control Joint: “#15 SOLID LEG Control Joint”, or equal, one-piece horizontal control joint.
j. Vertical Control Joints: “#XJ15 Expanded Wing Control Joint (Double J)”, or equal, used to relieve stresses in large plastered areas of walls, ceilings and plaster areas.
k. Transition Control Joint: “#9 Transition Control Joint”, or equal, one-piece drainage accessory for application at substrate transitions between masonry and framed walls.
l. Control Joints: “#15 Double V Control Joint”, or equal, used to relieve stresses in large plastered areas of walls, ceilings and plaster areas.
m. Clean-Finish Control Joints: “#XJ15 Expanded Wing Control Joint (Double J)”, or equal, used to relieve stresses in large plastered areas of walls, ceilings and plaster areas.
n. Cornerbeads: “#2A-Expanded Corner Bead”, or equal, used for reinforcing exterior corners, or equal.
o. Cornerite: Pre-shaped diamond mesh metal lath formed with minimum 3-inch legs to minimum 105 degrees for a snug fit; used as a reinforcement on inner corners.
p. Strip Lath: Welded wire metal lath formed in at least 4-inch wide strips with smooth outer edges. Used where small strips of lath are required so cutting is limited; and around window and door frames as butterfly reinforcement.

4. Requisite Properties:
   a. Size: Trim and accessories depths must match the thicknesses and number of plaster coats required.

b. Material: Zinc Coated (HDG) Steel Sheet conforming to ASTM A 653, CS Type B (commercial steel), with at least a G90 (galvanized) minimum coating designation and equal coating weight on each surface.
c. Surface Finish: Provide regular spangle surface finish.
d. Surface Treatment: Provide oiled surface treatment. (needed for enhanced formability)

2.2 CEMENTITIOUS SCRATCH AND BROWN COATS

A. Description: Pre-blended mixture conforming to ASTM C926, including cement, reinforcement fibers, hydrated lime, and proprietary ingredients for scratch and brown coats.

B. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Dryvit Systems, Inc.
   2. Omega Stucco.
   3. Parex USA, Inc.
   4. Sto Corp.

C. Product: “Parex Fiber-47 Armourwall 300 Scratch and Brown Sanded or Concentrate” manufactured by Parex USA, Inc., or equal.

D. Components:
   1. Cement: Portland cement conforming to ASTM C 150 Type I.
   2. Fine Aggregate: Dense graded (well-graded) air dry natural sands conforming to ASTM C 897 requirements for gradation, deleterious substances and organic impurities.
   3. Hydrated Lime: ASTM C 206, Type S. (special finishing hydrated lime)
   4. Fiber Reinforcement: Nylon or polypropylene monofilament fibers conforming to ASTM C 1116 Type III. (synthetic fiber-reinforced concrete or shotcrete) AR chopped glass fiber strands are prohibited.

E. Accessories:
   1. Admix and Bonding Agent: “Adacryl” 100-percent acrylic emulsion additive for Portland cement-based products manufactured by Parex USA, Inc., or equal
   2. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect plaster quality, durability, appearance, or performance.

2.3 PORTLAND CEMENT PLASTER FINISH

A. Reinforced Cementitious Leveling Coat:

1. Description: Premixed 100-percent acrylic polymer-based cementitious leveling coat and embedded reinforcing mesh.
2. Product: “Stucco Level Coat” manufactured by Parex USA, Inc., or equal.

B. Reinforcing Mesh:

1. Description: Symmetrical, interlaced open-weave alkali-resistant glass fiber fabric made with minimum 20 percent by weight alkaline resistant coating for compatibility with finish materials.
2. Products:
   a. Standard Mesh: “355 Standard Mesh” 4.5 ounce per square yard fiberglass mesh, or equal.
   b. Detail Mesh: “356 Short Detail Mesh” 4.5 ounce per square yard fiberglass mesh, or equal.
   c. Corner Mesh: “357 Corner Mesh” 7.2 ounce per square yard fiberglass mesh, or equal.
   d. Intermediate Impact Mesh: “358.10 Intermediate Impact Mesh” 12 ounce per square yard fiberglass mesh, or equal.
   e. High Impact Mesh: “358.14 High Impact Mesh” 15 ounce per square yard fiberglass mesh, or equal.
   f. Ultra High Impact Mesh: “358.20 Ultra High Impact Mesh” 20 ounce per square yard fiberglass mesh, or equal.
   g. Reinforced Preformed Mesh: “360 Fast Window Mesh" fiberglass mesh, or equal.

C. Cementitious Finish Coat:

1. Description: Factory-mixed Portland cement, integral-color plaster finish coat.
2. Products: Provide one of the following manufactured Parex USA, Inc., or equal.
   a. Standard Finish: “LaHabra Exterior Stucco Color Coat”, or equal.
   b. Smooth Finish: “La Habra Santa Barbara Mission Finish”, or equal.
   c. Specialty Finish: “Variance Specialty Finish”, or equal.
3. Requisite Properties:
   a. Finish: Match existing corridor.
   b. Color: Match existing corridor.

2.4 ACCESSORIES

A. Tie Wire: At least 0.048-inch diameter (ASW 18) soft temper zinc-coated wire conforming to ASTM A 641 Class 3 or A coating.

B. Fasteners for Concrete and CMU: At least 3/4-inch long hardened drive pin power-actuated fasteners (PAF) with 1/2-inch diameter galvanized disc or washer; or 9-gauge, minimum 3/8-inch diameter head, minimum 3/4-inch long concrete nails.

C. Fasteners for Metal Framing: 0.164-inch shank diameter (#8-32 UNC) by at least 1-1/4-inch-long Philips drive socket, bugle or wafer head, self-drilling stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners, unless another fastener type is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.

D. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Factory-Mixed Products:

1. Open plaster packaging and containers only as required for use and mix only in designated areas.
2. Thoroughly agitate and stir plaster to a uniform and smooth consistency suitable for proper installation.
3. Do not reduce, alter, or introduce foreign materials into plaster, except in conformance with manufacturer’s instructions and other requirements and recommendations.

B. Site Mixing: Batch mix plaster in conformance with manufacturer’s instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.

1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment, and are prohibited from measuring or dispensing mix materials.
2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.

3. Do not reduce, alter, or introduce foreign materials into mix materials, except in conformance with manufacturer's instructions and other requirements and recommendations.
4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
2. Verify items penetrating plaster are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and plaster finish installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent intrusion or migration of liquids.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any specified or other warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install plaster using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Securely attach plaster trim and lath in place to supporting construction. Continuous expansion and control joints must be installed at locations in conformance with ASTM C1063 and ASTM C926.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed plaster must be warrantable. Do not install, correct, or replace plaster in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Provide sufficient manpower and equipment to ensure a continuous operation free of cold joints, scaffold lines, texture variations, and other objectionable conditions.
   a. Plaster surfaces full height and width between control joints in one operation once the application of any coat has begun.
   b. Stop plaster at control joints, edges, or corners only.
   c. Apply plaster flush with metal trim members and make corners square and true.
2. Finish plaster in a true, plumb or level plane flush with grounds.
3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal. Apply sealant in grove to metal frame.
4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
5. Protection Measures during Application and Cure:
   a. Protect plaster products in conformance with manufacturer's instructions.
   b. Protection measures must shield the completed scratch, brown and finish coat applications from direct sunlight and wind exposure (i.e., provide dark colored coverings or barriers).
   c. The combination of curing and protection measures that are employed must prevent drying, uneven or excessive evaporation and strong natural or artificial blasts of dry air during the curing period.

C. Plaster Accessory Installation:

1. Install with surfaces and edges plumb, level and in alignment with a tolerance of not more than 1/8-inch in 5 feet. Shim as required and align joints with concealed splice or tie plates.
   a. Use single length pieces wherever length of run does not exceed longest standard stock length available.
   b. Miter or cope at corners with hairline joints, and seal with sealant specified in Section 07 92 00. Seal butt splices in the same manner.
   c. Attach securely to supports with same fasteners and spacing as required for metal lath. Wire-tie at no less than 6-inches-on-center to metal lath.
2. Install foundation weep screed.
3. Install corner reinforcement.
4. At plaster terminations, provide casing bead at the following locations:
   a. Where plaster termination abuts other finishes, isolate casing bead from contact with adjacent finishes with 1/4-inch thick tape sealant specified in Section 07 92 00.
   b. Where plaster termination is not covered by another finish or applied trim, provide cased opening by installing casing bead around perimeter of opening as indicated.

D. Control Joint Installation:

1. Install control joints in specific locations indicated on the Drawings, approved by Architect, and as follows.
   a. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      1) Vertical Surfaces: 144 sq. ft.
      2) Horizontal and Other Non-Vertical Surfaces: 100 sq. ft.
   b. At distances between control joints of not greater than 18 feet on center
   c. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   d. Where control joints occur in surface of construction directly behind plaster.
   e. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
2. Wire tie to metal lath at maximum 6 inches on center. Do not attach horizontal control joints to vertical control joints at intersections across the joint.
3. Install vertical control joint first, continuous from top to bottom of wall.

4. Install horizontal control joints last and split where it meets the vertical control joint.
5. Install joints plumb, level, evenly spaced, at locations and spacing indicated, and in one piece.

E. Metal Lath Installation:
1. Comply with the lath manufacturer's printed installation instructions, and with ASTM C 1063 and Appendix, and the CBC.
2. Unless otherwise indicated, install all horizontal trims, joints, and accessories prior to installing lath.
3. Apply metal lath in conformance with the manufacturer's published installation standards.
4. Apply lath taut with long dimension at right angle to supports.
5. Stagger vertical joints. Lap end joints at least one inch, and lap horizontal joints at least 1/2-inch.
6. Where end laps occur between framing members, wire-tie ends at not more than 9 inches on center.
7. Cut lath at expansion and control joint locations. Lath must be secured to expansion and control joints at each side of joints and lapped or spliced at interior and exterior corners.
8. Hold lath 1/4-inch clear of items projecting through the plaster.
9. Attach lath through WRB and sheathing into supporting construction at 6 inches on center.

F. Scratch Coat Installation:
1. Apply with sufficient material to cover well and sufficient pressure to form good, full keys. Mix and apply scratch coat and admix and bonding agent products in conformance with manufacturer's published instructions.
2. Minimum thickness of scratch coat shall be 3/8-inch when measured from backing to crest of scored plaster.
3. Scratch before plaster hardens to provide sufficient mechanical key for brown coat. Moist cure continuously for a minimum of 48 hours in conformance with ASTM C 926 and building codes, including weekends and holidays.
4. Score horizontally.

G. Brown Coat Installation:
   1. Surface of the scratch coat must be dampened with fog spray prior to application of the brown coat. Do not over-saturate.
   2. Apply brown coat approximately 3/8-inch thick at a uniform thickness that matches the grounds of the accessories. Bring to a true, even surface by rodding and floating and leave slightly rough, uniform texture to receive the finish coat.
   3. Begin floating only after hydration of the cement has commenced, and sufficient moisture has evaporated so that surface sheen will disappear, but before plaster has become too rigid to be moved under the float.
   4. Moist cure continuously for at least 48 hours in conformance with ASTM C 926 and building codes, including weekends and holidays.
      a. Specified moist curing period is a minimum requirement.
      b. Determine the most effective procedure for curing and time lapse between applications of coats based upon climatic and job conditions.
      c. Fog as frequently as required to prevent loss of moisture from the plaster. Avoid erosion damage to the plaster surface.

H. Finish Coat:
   1. Apply finish coat not less than 7 days after brown coat has been applied. Dampen brown coat thoroughly and apply finish coat to a uniform minimum thickness of 1/8-inch to match approved mockup. Correct irregularities prior to application.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed plaster in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed plaster unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed plaster as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 2815
GMF GYPSUM TILE BACKING BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. GMF gypsum backing board.
   2. Installation materials.
   3. Joint treatment materials.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 06 16 43 for GMF gypsum sheathing.
   2. Section 09 21 16 for GMF gypsum board shaft wall liner and wall panels.
   3. Section 09 29 00 for requirements for marking and identification of wall and partition construction required to have protected openings or penetrations.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. GMF: Glass Mat Faced.

B. Definitions:
   1. Manufacturer: Means the backing board manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished backing boards.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Backing boards must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Backing board must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
      a. Backing board manufactured outside of North America by a domestic company are prohibited.
      b. Backing board manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company are prohibited.
   3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. General: Comply with GA publication GA 801 "*Handling Gypsum Board*" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.

B. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

C. Storage: Store unloaded items as shipped, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

   1. Store items indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas; where "wet work" within storage areas (e.g., concrete, cast underlayment, mortaring, grouting, plastering, gypsum board finishing, etc.) is complete and cured or dried to a condition of equilibrium.
   2. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.

D. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

E. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

F. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide products manufactured by one of the following, or equal.

   1. CertainTeed Corp.
   2. GP Building Products.
   3. National Gypsum Co.
   4. USG Corp.

2.2 GMF GYPSUM BACKING BOARD

A. Description: Gypsum-based GMF water-resistant gypsum backing panel conforming to ASTM C 1178 installed as a base for the application of ceramic tile.

B. Applications: Installed as a base for the application of ceramic tile.

C. Restrictions: May not be used

1. as a base for nailing or mechanical fastening;
2. as a radiant barrier behind fireplaces;
3. in exterior applications; and
4. In direct contact with concrete or concrete masonry units.

D. Products: Provide one of the following, or equal.

1. “DensShield Tile Backer” manufactured by GP Building Products.
2. “GlasRoc Tile Backer” manufactured by CertainTeed Corp.
3. “Gold Bond eXP Tile Backer” manufactured by National Gypsum Co.

E. Requisite Properties:

1. Minimum Size: At least 4-foot by 8-foot sheets.
2. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
3. Minimum Mass: At least 2.2 pounds per square foot.
4. Edges: Tapered long edges and square ends.
5. Facers: Heat-cured, acrylic-coated, fiberglass mat wrapped around panel face, back side, and long edges. Water repellent paper facers and backings are prohibited.

F. Performance Requirements:

1. Resistance to the Propagation of Mold and Mildew: Minimum score of 10 (no visual defacement), when tested in conformance with ASTM D 3273.

2.3 INSTALLATION MATERIALS

A. Fasteners: Provide 0.164-inch shank diameter (#8-32 UNC) by at least 1-1/4-inch-long Philips drive socket, bugle or wafer head, self-drilling stainless steel, bi-metal, duplex anti-corrosive steel, 3-coat anti-corrosive steel, or ceramic-coated anti-corrosive steel screw fasteners, unless another fastener type is explicitly indicated; or is otherwise supplied, required, recommended, or accepted by the manufacturer.

2.4 JOINT TREATMENT MATERIALS

A. Glass Mesh Tape:

1. Description: 2-inch wide, alkali-resistant, polymer-coated, 10x10 glass-fiber mesh tape.
2. Application: Used in combination with joint sealant as a panel joint and penetration treatment for long-term joint protection.
3. Product: Supplied, required, recommended, or accepted by the manufacturer.

B. Polymer-Modified Cementitious Mortar:

1. Description: Premium-grade (best quality grade), single-component, ultra-high-performance, polymer-modified Portland cement mortar conforming to A118.15 shear bond strength requirements.
2. Application: Used for embedding joint tape and finishing backing board in wet locations (e.g., toilet rooms, shower rooms, saunas, steam rooms, kitchens, swimming pool enclosures, etc.). Do not use drying-type joint compound, setting-type joint compound, or paper tape in wet locations.
3. Products: Provide one of the following, or equal.
   a. “MegaFlex Crack Prevention Mortar” manufactured by Custom Building Products.
   b. “254 Platinum” manufactured by LATICRETE International, Inc.
   c. “Ultraflex 3” manufactured by Mapei Corp.

C. Setting-Type Joint Compound:

1. Description: Lightweight, sandable, chemically setting powder compound conforming to ASTM C 475 and
2. Application: Used for embedding joint tape and finishing backing board in locations other than wet locations. All-purpose and drying type joint compounds are prohibited.
3. Product: “ToughRock Sandable Setting Compound” manufactured by GP Building Products, or equal.

2.5 ACCESSORIES

A. Sealant: Provide fluid-applied low modulus joint sealant specified in Section 07 92 00, unless another type of sealant; or supplied, required, recommended, or accepted by the manufacturer to seal sheathing joints and fastener penetrations.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install backing boards using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed backing boards must be warrantable. Do not install, correct, or replace backing boards in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach backing boards to supporting construction.
2. Do not install vapor retarders directly behind backing board.

C. Installation Tolerances: Install backing boards to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

END OF SECTION

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SECTION 09 2900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gypsum board panels.
   2. Metal trim.
   3. Installation materials.
   4. Joint treatment materials.
   5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 06 16 43 for GMF gypsum sheathing.
   2. Section 09 21 16 for GMF gypsum board shaft wall liner and wall panels.
   3. Section 09 28 15 for GMF gypsum tile backing board.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. GMF: Glass Mat Faced.

B. Definitions:
   1. Manufacturer: Means the gypsum board manufacturer, unless otherwise indicated.
   2. Enclosure: Means a level of protective resistance to weather provided for interior spaces during the construction phase by either permanent construction or substantial temporary construction. Other terms, including “enclosed” and similar terms, have the same meaning as “enclosure”.
      a. Uncontrolled Enclosure: Means short-term, limited, temporary protection against wind for up to 6 months before completion of the permanent enclosure, as determined by the Architect, whose decision is final.
      b. Partially-Controlled Enclosure: Means medium-term, limited, temporary protection against both wind and rain for up to 12 months before completion of the permanent enclosure, as determined by the Architect, whose decision is final.

c. Permanent Enclosure: Means complete permanent protection against wind, temperature, humidity, atmospheric pressure, and precipitation; provided by a permanent insulated and weathertight roofing system, permanent insulated and weathertight exterior wall construction, and openings closed with permanent protectives or substantial temporary closures equivalent in protection to permanent protectives, as determined by the Architect, whose decision is final.

3. Dry-In: Means that the building shell is sufficiently complete to keep out wind, rain, and other weather. Other terms, including “box-in” and similar terms, have the same meaning as “dry-in”. At a minimum, dry-in includes
   a. all exterior walls are constructed with weather-resistive barrier or air barrier applied;
   b. roof deck is installed with an appropriate waterproof covering; and
   c. windows and doors are installed.
4. Locations:
   a. Wet Locations: Means interior locations subject to moisture during normal activities for which the space was designed (e.g., toilet rooms, shower rooms, saunas, steam rooms, kitchens, swimming pool enclosures, etc.)
   b. Dry Locations: Means normally dry interiors.
5. Pre-Rock Construction: Means the limited installation of gypsum board panels in locations exposed to ambient moisture during the normal construction cycle before the structure is either partially controlled or permanently enclosed. Pre-rock construction is not limited to top-down construction. Other terms, including “pre-dry-in” and similar terms, have the same meaning as “pre-rock”.
6. Top-Down Construction: Means the limited installation of gypsum board panels only in plenums above the finished ceiling plane after the installation of metal framing is complete and before the installation of ducts, conduits, pipes, or other items that penetrate the gypsum board assemblies begins.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate locations of control joints to ensure the recommended spacings of control joints for gypsum wall and ceiling panels are accommodated.
      a. If control joints are not indicated on the construction drawings, do not anticipate the quantity is zero.
      b. Propose locations on shop drawings or submit an RFI to the Architect before submitting bid proposal.

2. Final locations of control joints are subject to Architect's approval.

B. Preinstallation Meeting:

1. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation.
3. Discuss and finalize locations and extents of all control joints.
4. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed underlayment. Resolve each condition.
5. Finalize construction schedule.
6. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing: Deliver paper-faced gypsum board to the project site only after building dry-in.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing locations, sizes, and extents of all control joints. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished gypsum board.

a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Gypsum board must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Gypsum board must be manufactured in North America by a domestic company from gypsum mined in North America; synthetic gypsum recovered from coal-fired plants operating in North America (FGD gypsum); or a combination of both.
   a. Gypsum board manufactured outside of North America by a domestic company are prohibited.
   b. Gypsum board manufactured outside of North America by a foreign company and relabeled or rebranded by a domestic company are prohibited.
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.6 HANDLING

A. General: Comply with GA publication GA 801, "*Handling Gypsum Board*" and applicable requirements of ASTM C 1264 for the inspection, rejection, certification, packaging, marking, shipping, handling, and storage of gypsum panel products.

B. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.

C. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

   1. Furnish adequate dunnage and bracing during storage.
   2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
   3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

D. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

E. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective gypsum board with undamaged new gypsum board that does not exhibit deterioration, damage, or defects.

F. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide products manufactured by one of the following, or equal.

   1. CertainTeed Corp.
   2. GP Building Products.

3. National Gypsum Co.
4. USG Corp.

2.2 PRE-ROCK GYPSUM BOARD

A. Description: GMF interior gypsum panels conforming to ASTM C 1658.

B. Application: Pre-rock panels must be used when gypsum board is installed prior to dry-in.

C. Products: Provide one of the following, or equal.

1. “DensArmor Plus Interior Panels” manufactured by GP Building Products.
2. “e^2XP Interior Extreme” manufactured by National Gypsum Co.
3. “SHEETROCK Glass-Mat Panels Mold Tough” manufactured by USG Corp.

D. Requisite Properties:

1. Minimum Size: Provide at least 4-foot by 8-foot sheets.
2. Minimum Thickness: 1/2-inch regular core panels and 5/8-inch Type X panels.
3. Edges: Tapered long edges and square ends.
4. Facers: Heat-cured, acrylic-coated, fiberglass mat on the face side, back side, and around long edges. Water repellent paper facers and backings are prohibited.

2.3 FIRE-RESISTANCE RATED GYPSUM BOARD

A. Fire-Resistance-Rated Gypsum Wall and Ceiling Board:

1. Description: Gypsum board conforming to ASTM C 1396.
2. Applications: Installed in fire-resistance-rated and non-rated interior partition assemblies constructed in dry locations.
3. Products: Provide one of the following, or equal.
   a. “ProRoc Type X” and “ProRoc Type C” manufactured by CertainTeed Corp.
   b. “ToughRock Fireguard” and “ToughRock Fireguard C” manufactured by GP Building Products.
   c. “Gold Bond Fire-Shield” and “Gold Bond Fire-Shield C” manufactured by National Gypsum Co.
   d. “SHEETROCK “Firecode Core”” and “SHEETROCK “Firecode C Core””
4. Requisite Properties:
   a. Minimum Size: At least 4-foot by 8-foot sheets.
   b. Minimum Thickness: At least 5/8-inch.

c. Core: Provide Type X panels in walls and Type C panels in ceilings, unless otherwise indicated on the Drawings.
d. Minimum Mass: At least 2.2 pounds per square foot.
e. Edges: Tapered long edges and square ends.
f. Facers: Paper face, back, and long edges.

B. Mold- and Moisture-Resistant Fire-Resistance-Rated Gypsum Wall and Ceiling Board:
1. Description: Mold- and moisture-resistant and fire-resistance-rated gypsum board conforming to ASTM C 1396.
2. Applications: Installed as the inside face of exterior wall assemblies; and in fire-resistance-rated and non-rated interior partition assemblies constructed in wet locations.
3. Products: Provide one of the following, or equal.
a. “ProRoc Moisture and Mold Resistant Gypsum board with M2Tech” manufactured by CertainTeed Corp.
b. “ToughRock Mold-Guard” manufactured by GP Building Products.
c. “Gold Bond XP Gypsum Board” manufactured by National Gypsum Co.
d. “SHEETROCK Mold Tough” manufactured by USG Corp.
4. Requisite Properties:
a. Minimum Size: At least 4-foot by 8-foot sheets.
b. Minimum Thickness: At least 5/8-inch.
c. Core: Provide Type X panels in walls and Type C panels in ceilings, unless otherwise indicated on the Drawings.
d. Minimum Mass: At least 2.2 pounds per square foot.
e. Edges: Tapered long edges and square ends.
f. Facers: Heavy-duty mold- and moisture-resistant paper face, back, and long edges.
5. Performance Requirements:
a. Mold Resistance: Must earn a score of at least 10, when tested in conformance with ASTM D 3273.

2.4 METAL TRIM

A. Steel Trim:
1. Description: Paper-faced galvanized steel sheet trim pieces conforming to ASTM C 1047.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
a. CEMCO.
b. Clinch-On Cornerbead Co.
c. Stockton Products.

d. Western Metal Lath.
e. USG Corp.

3. Products: “BEADEX” paper-faced metal bead and trim manufactured by USG Corp., or equal.
   a. Corner Beads: Provide to protect exterior corners. Provide corner beads with notched or flexible flanges at curved edges.
      1) 90-degree Outside Corner Bead: “Micro Bead Style”, or equal.
      2) 90-degree Inside Corner Bead: “B2 Style”, or equal.
   b. Casing Beads: Provide long-flanged L- or LC-beads at exposed panel edges indicated as receiving joint compound; provide short-flanged U-beads at exposed panel edges that do not receive joint compound.
      1) J Trims (J-shaped with exposed long flange): “B9J Style”, or equal.
      2) L Trims (L-shaped with exposed long flange): “B4 Style”, or equal.

B. Metal Control Joints:
   1. Description: One-piece solid zinc control joint supplied with factory-applied removable tape to ensure a clean joint.
   2. Products: Provide one of the following, or equal.
      a. “NO93 Control Joint” manufactured by Alabama Metal Industries Corp. Building Products (AMICO).
      b. “Niles-093 Zinc Control Joint” manufactured by Niles Building Products Co.
      c. “SHEETROCK Zinc Control Joint No. 093” manufactured by USG Corp.
   3. Requisite Properties:
      a. Minimum Length: At least 10 feet long; provide longest possible lengths to minimize or avoid joints.

2.5 INSTALLATION MATERIALS

A. Fasteners: Provide #6-32 UNC 2B (0.138-inch shank diameter, 32 threads per inch) by at least 1-1/4-inch long, Philips bugle head, coarse thread, self- piercing or self-drilling (as applicable) phosphate coated steel screw fasteners, unless another fastener type is explicitly indicated; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Laminating Adhesive:

1. Description: Lightweight, sandable, chemically-setting powder compound conforming to ASTM C 475.
2. Application: Used for bonding gypsum board to studs, laminating gypsum board to gypsum board, and bonding gypsum board to concrete or CMU walls.
3. Product: “SHEETROCK Easy Sand Joint Compound” manufactured by USG Corp., or equal.

2.6 JOINT TREATMENT MATERIALS

A. Joint Tape:

1. Description: Nominal 2-inch wide gypsum panel joint and corner reinforcement conforming to ASTM C 475.
2. Products:
   a. Fiberglass Joint Tape: “SHEETROCK Fiberglass Drywall Tape” manufactured by USG Corp., or equal.
   b. Paper Joint Tape: “BEADEX Drywall Joint Tape” manufactured by USG Corp., or equal.
   c. Fiberglass Mesh Tape: Prohibited.

B. Setting-Type Joint Compound:

1. Description: Lightweight, sandable, chemically setting powder compound conforming to ASTM C 475, and used for embedding joint tape and finishing interior gypsum panels.
2. Applications:
   a. Pre-Filling Gypsum Panel Joints throughout the Project: Use setting-type compound for open joints, beveled panel edges, and at damaged surface areas at all locations.
   b. All Other Coats: Use setting-type compound for embedding and first coat, fill coat, finish coat, and skim coat at wet locations; and at locations where panels are subject to moisture and high humidity.
3. Product: “SHEETROCK DURABOND” manufactured by USG Corp., or equal.

C. Drying-Type Joint Compound:

1. Description: Vinyl-type compound conforming to ASTM C 475, and used for embedding joint tape, finishing interior gypsum panels, and hand-applying simple texturing.

2. Application: Use for embedding and first coat, fill coat, finish coat, and skim coat at dry locations, and at locations where joint is subject to moisture and high humidity.
3. Product: “SHEETROCK All Purpose Joint Compound – SELECT” and “SHEETROCK Brand Plus 3 Lightweight All-Purpose Joint Compound” manufactured by USG Corp., or equal.

2.7 ACCESSORIES

A. Applied Level 5 Wallboard Finish Products: Prohibited.

B. Repair Clips: “SHEETROCK Drywall Repair Clips” manufactured by USG Corp., or equal.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.8 MARKING AND IDENTIFICATION

A. Description: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions, and other walls required by the California Building Code to have protected openings or penetrations must be effectively and permanently identified with stenciling located in accessible concealed floors, floor-ceiling assemblies, plenums, and attic spaces

B. Paint Products: Specified in Section 09 91 00.

C. Fire Walls, Fire Barriers, and Fire Partitions: Paint 6-inch high stripes not more than 15 feet from the end of each fire wall, fire barrier, or fire partition; and at intervals of not more than 30 feet, when measured horizontally along the wall, barrier, or partition. Paint stenciled letters over the 6-inch high stripes, leaving at least a one-inch border around the stenciled letter copy.

1. Stripe Color: Match Federal Standard 595B color FS 31350 (red).
2. Stenciled Letter Color: Match Federal Standard 595B color FS 37925 (insignia white).
3. Stenciled Letter Font: 288-Point Linotype Neue Helvetica Regular Bold.
4. Stenciled Letter Copy:
   a. Fire Walls: “FIRE WALL – PROTECT ALL OPENINGS”.
   b. Fire Barriers: “FIRE BARRIER – PROTECT ALL OPENINGS”.
   c. Fire Partitions: “FIRE PARTITIONS – PROTECT ALL OPENINGS”.

D. Smoke Barriers and Smoke Partitions: Paint 6-inch high stripes not more than 15 feet from the end of each smoke barrier or smoke partition; and at intervals of not more than 30 feet, when measured horizontally along the wall, barrier, or partition. Paint stenciled letters over the 6-inch high stripes, leaving at least a one-inch border around the stenciled letter copy.
   1. Stripe Color: Match Federal Standard 595B color FS 36492 (gray).
   2. Stenciled Letter Color: Match Federal Standard 595B color FS 37038 (black).
   3. Stenciled Letter Font: 288-Point Linotype Neue Helvetica Regular Bold.
   4. Stenciled Letter Copy:
      a. Smoke Barriers: “SMOKE BARRIER – PROTECT ALL OPENINGS”.
      b. Smoke Partitions: “SMOKE PARTITIONS – PROTECT ALL OPENINGS”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
   1. Install gypsum board using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed gypsum board must be warrantable. Do not install, correct, or replace gypsum board in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Single-Layer Application:
   a. On ceilings, apply gypsum panels before wall or partition board application to greatest extent possible, and at right angles to framing, unless otherwise indicated.
   b. On partitions and walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assemblies; minimize end joints.
   c. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assemblies.
   d. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   e. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   f. Securely attach gypsum panels to supports with steel drill screws.
2. Multilayer Application:
   a. On partitions and wall assemblies, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   b. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   c. Securely attach base layers and face layers separately to supports with screws. Do not glue multiple layers of gypsum board together.

3. Trim:
    a. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in conformance with manufacturer's instructions.
    b. Control Joints: Install control joints in conformance with ASTM C 840 and in specific locations indicated or accepted by the Architect.
    C. Trim: Install cornerbead at outside corners; install LC-Bead or U-Bead at exposed panel edges.
4. Finishing Gypsum Board:
    a. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and other items and conditions as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
    b. Prefill open joints, beveled edges, and damaged surface areas.
    c. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

C. Acoustical Installation Requirements:
1. Comply with ASTM C 840.
2. Install panels with face side out. Butt panels together with light contact at edges and ends and not more than 1/16-inch of open space between panels. Do not force into place.
3. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided.
4. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
5. All joints must be staggered at least 24 inches apart and taped and sealed. Where multi-layer construction is indicated, each layer must be complete, including tape, fillers, and seals, before further layers are added
6. Joints between uncut sheet that lie in the same plane must be tight butt joints. The gap between sheets may not exceed 1/8-inch.
7. Tolerances: Install partitions with the following maximum gaps between gypsum board and abutting construction.
    a. Floor: 1/4-inch.
    b. Masonry and Concrete Walls: 1/4-inch.
    c. Underside of Slab or Decking: 1/4-inch.

8. Damaged sheets may not be used. Joints between cut sheets that lie in the same plane or between any sheets that lie in different planes (i.e., at any angle or corner joint) must be cut back to produce a neat gap not more than 1/16-inch wide and the joint filled and sealed with specified non-hardening acoustic sealant. Subsequent layers must cover the joint and the opposite sheet must be cut short and filled and sealed.
9. In the first layer, all joints between boards must be backed by a continuous stud, noggin, bearer, or angle.
10. Specified batt insulation must be placed in the wall cavity and be suitably retained so that it is in contact with only one face of the partition and does not sag.
11. Wall ties between adjacent independent partitions must be of a resilient type and accepted by the Architect. The minimum number compatible with safe construction should be used.
12. The walls must be constructed from slab to slab (full height) unless otherwise indicated.
13. Where door frames are built into the wall, the vertical and horizontal sections of the frame shall be fully filled with plaster. The plaster joint shall be to the full depth of the wall.
14. Top and bottom of stud walls must be Isolated with resilient partition isolation pad (e.g., “Wallmat and Anchor Isolator” manufactured by Kinetics Noise Control, Inc., or eqal)
15. Lateral support at the head of vibration isolated gypsum walls must be a continuous steel angle with a resilient pad to avoid rigid contact between the wall and the lateral support construction and accepted by the Architect. (e.g., wall mount type AB by Mason Industries, or equal)
16. All joints between gypsum and other constructions must be dense packed with fiberglass to the full depth of the wall and fully sealed with a sealant bonding to the gypsum and the other construction.
17. Where gypsum walls abut a profiled metal decking, the gypsum wall should seal to a minimum 16 -gage steel plate attached to the deck, with the profile void above the plate filled with fiberglass and acoustically sealed on both sides with a fire barrier putty having a minimum density of 40 pounds per square foot. (e.g., 3M Moldable Putty or equal)
18. For top of walls that are perpendicular with the metal decking maximum of ½ inch gap from the flute and seal the openings with acoustical sealant.

19. Penetrations of building services (e.g., ducts, conduits, pipes) through full height and acoustic rated partitions must be sealed airtight in conformance with the following.
    a. Seal all annular openings less than 1/2-inch with acoustical sealant and backer rod as required to hold sealant in place.
    b. When the annular opening is larger than 1/2-inch, provide gypsum board patch to reduce the opening to less than 1/2-inch, and seal as above.
    c. Prior to sealing penetrations, verify penetrating elements such as piping and ductwork are free and clear of the opening being sealed.
20. Cut-outs must be regular and may not fracture gypsum board core or tear covering and must conform to the following.
    a. Minimize penetrations of insulated wall and ceiling construction. Penetrate only where necessary and fully seal airtight at the perimeter using acoustical sealant.
    b. Where ducts and piping greater than 3-inches in diameter penetrate insulated wall or ceiling construction, provide a clearance of one-inch plus 1/4-inch at the perimeter of the penetration
    c. Where conduit piping 3-inches diameter and less (including mechanical, hydraulic, plumbing, etc.) pass through insulated wall or ceiling construction, provide a clearance of 1/4-inch plus 1/8-inch between the conduit or piping and the structure, unless otherwise shown.
    d. After the ductwork, conduit, or piping is installed, repair the gypsum board perimeter clearance to the specified tolerance as required. Where the clearance exceeds 3/4-inch, provide a sheet metal sleeve within the partition packed with safing insulation and seal both sides airtight with acoustical sealant.
    e. Where penetration clearances are 3/8-inch or less, seal airtight with acoustical sealant at gypsum board. Where the perimeter clearance exceeds 3/8-inch, use a flexible backing rod to seal against.
    f. All gypsum board penetrations (including those resulting from wiring, cables, and electrical junction boxes) must be sealed airtight with acoustical sealant.
    g. The back and sides of junction boxes in sound-rated construction must be sealed airtight with sheet caulking. Seal perimeter face at gypsum board with acoustical sealant.

h. Recessed panel boards, equipment, boxes, and other items having a penetration area greater than 25 square inches at sound-rated partitions are fully enclosed and sealed with 5/8-inch thick gypsum board or 2 pound per square foot sheet metal.

i. Seal multiple conduit penetrations airtight with expanding fire foam sealant.

D. Interface with Adjacent Items:

1. Provide materials, components, and accessories normally furnished or necessary to securely attach gypsum board to supporting construction.

2. Do not install vapor retarders directly behind gypsum board.

E. Installation Tolerances: Install gypsum board to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;

2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and

3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed gypsum board in place from deterioration, and damage until Substantial Completion. Remove and replace wet, moisture-, or mold-damaged panels.

   1. Indications panels are wet or moisture damaged include discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

B. Do not store anything adjacent to or against installed gypsum board unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed gypsum board as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

3.6 GYPSUM BOARD FINISH SCHEDULE

A. General: Finish gypsum board surfaces with exposed joints, corners and edges reinforced or trimmed in conformance with ASTM C 840, Gypsum Association publication GA-214, "*Recommended Levels of Gypsum Board Finish*", and the following.

B. Levels of Gypsum Board Finish:

   1. Level 0: Use for first layer of multiple layer construction and gypsum board ledge guards in elevator shafts.
   2. Level 1: Use in plenum areas above ceilings, interior faces of shafts, in attics, and in areas where the assembly will generally be concealed.
   3. Level 2: Use where moisture-resistant gypsum backing board is used as a substrate for tile; and in storage and similar areas where surface appearance is not of primary concern.
   4. Level 3: Use in areas where heavy grade wall coverings are to be applied as the final decoration.
   5. Level 4: Use in areas where light texture or backed lightweight wall covering is applied; and all areas indicated as receiving a paint finish, except where Level 5 finish is indicated.
   6. Level 5 (spray and roller-applied products are prohibited): Use where indicated on the Drawings.

END OF SECTION

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SECTION 09 3000
TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tile surfacing units.
   2. Thresholds.
   3. Tile waterproofing.
   4. Installation materials.
   5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.
   2. Section 09 62 62 for metal flooring transitions.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. TCNA: Tile Council of North America.

B. Definitions:
   1. Manufacturer: Means the tile, installation material, or accessory manufacturer, as the context admits, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify chemical and adhesive compatibility of selected waterproofing and crack isolation membranes and mortar with installed curing compounds and moisture vapor emission control systems, based on current product formulations.
   2. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified mortar and grout are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.

B. Preinstallation Meeting:
   1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.

2. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including special details and conditions that might affect installation.
3. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed tile. Resolve each condition.
4. Finalize construction schedule.
5. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:
1. Schedule tile deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install tile only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with tile; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible surface treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install tile only after penetrating items are installed and after overhead finishing operations are complete.

D. Scheduling:
1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Access Restrictions: Close spaces during installation. Keep closed to foot traffic after installation for at least 48 hours and to rolling load traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

2. Shop Drawings:

a. Submit dimensioned plans and elevations drawn to scale and showing floor and wall design patterns and layouts.

b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.

3. Samples: Submit at least 8-inch square representative samples of each tile variety for each specified color and finish, glued to hardboard backing. Grout all joints with specified grout.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished tile, installation materials, and accessories.

a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals: Before Final Completion, deliver to the Owner tile cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.

1. Furnish at least 2 percent of the total installed for each tile type, color, composition, grade, finish, and variety.

2. Furnish at least 2 percent of the total amount installed for each grout type, color, and composition. but not less than one unopened container.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Tile must be obtained through one source from the same supplier (to ensure compatibility and appearance).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Installation Materials (Setting Materials): Installation materials, including waterproofing membranes, crack isolation membranes, mortar, adhesive, grout, sealers, and other installation materials and accessories must be obtained through one source from the same manufacturer (to ensure compatibility and a warrantable installation).
3. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Tile Floor Finish Regulatory Requirements:

1. Floor surfaces must be stable, firm, and slip resistant, conforming to the requirements of California Building Code Section 11B-302.1.
2. Allowable Static Coefficient of Friction Value (SCOF): At least 0.6 for level surfaces and at least 0.8 for sloped surfaces, when measured in conformance with ASTM D 2047.
3. Allowable Dynamic Coefficient of Friction Value (DCOF): Between 0.35 and 0.45, when measured in conformance with ANSI B101.3 under wet conditions.
4. Radiant Flux Classification: Provide flooring having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.

C. Tile Wall Finish Regulatory Requirements:

1. Surface-Burning Characteristics: Provide walls and ceilings having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

D. Quality Standards:

1. Installation Standards: Comply with parts of ANSI A108 Series publication requirements that apply to types of setting and grouting materials and to installation methods indicated.
2. Installation Guidelines: Comply with TCNA publication "*Handbook for Ceramic, Glass, and Stone Installation"* requirements for installation methods indicated.

E. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing tile for previous projects similar to this project in size, material, design, and complexity.
   a. Individuals must be Ceramic Tile Education Foundation (CTEF) Certified Tile Installers and current in their certification.
   b. Individuals installing large format tile, mudwork for walls or floors, or waterproofing membranes must be certified through Advanced Certifications for Tile Installers (ACT) for installation and current in their certification.
2. Supervisors: Individuals must have experience installing tile for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading tile installers.
   a. Supervisors must be Ceramic Tile Education Foundation (CTEF) Certified Tile Installers and current in their certification.
   b. Supervisors of individuals installing large format tile, mudwork for walls or floors, or waterproofing membranes must be certified through Advanced Certifications for Tile Installers (ACT) for installation and current in their certification.

F. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of tile is made from field samples.
3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective materials with undamaged new materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install tile only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:
1. Substrate Dimensional Tolerances: Surfaces receiving tile must be flat with 1/4-inch within any 10-foot radius.
2. Deflection: Maximum deflection of substrate system under positive or negative design loads must not exceed L/360 of span.
3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

1.8 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for waterproofing products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.

B. Installer Guarantee: Furnish to the Owner a written guarantee for waterproofing work of this specification section against all defects in materials and workmanship for 2 years from date of acceptance. Guarantees must be properly prepared and signed on the guarantee form in Division 01.

PART 2 - PRODUCTS

2.1 TILE SURFACING UNITS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 THRESHOLDS

A. Marble Thresholds:

1. Description: Marble conforming to ASTM C 503, Classification I (calcite), Soundness Group A (sound marbles with uniform and favorable working qualities; containing no geological flaws, voids, spalls, cracks, open seams, pits or other defects).
2. Product: Bianco Carrara (Carrera) marble thresholds.
3. Requisite Properties:
   a. Size and Thickness: Indicated on the Drawings.
   b. Color: White, with wispy grey bands through the stone.
   c. Finish: Honed.

2.3 INSTALLATION MATERIALS

A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Moisture Vapor Transmission Reduction Coating: Specified in Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.

C. Fluid-Applied Waterproofing / Crack Isolation Membrane:

1. Products: Provide one of the following, or equal.
   a. “RedGard” elastomeric membrane manufactured by Custom Building Products.

b. “Laticrete HydroBan” manufactured by LATICRETE International, Inc.
c. “Mapelastic AquaDefense” manufactured by Mapei Corp.

2. Accessories:
a. Primer: One-part waterproofing / crack isolation membrane diluted with 4 parts water and applied at a rate of 300 square feet per gallon of reduced material; or other substrate sealer or primer supplied, required, recommended, approved or accepted manufactured by the waterproofing/crack isolation membrane manufacturer.
b. Fiberglass Mesh: Provide manufacturer’s standard alkali-resistant reinforcing mesh for changes of plane and for gaps 1/8-inch wide or greater.
c. Other Accessories: Provide other accessories and secondary items supplied, required, recommended, approved, or accepted manufactured by the waterproofing/crack isolation membrane manufacturer.

D. Thin Bed Mortar (Thinset) Installations (horizontal applications between 3/32- and 3/16-inch thick after beat-in):
1. Description: Premium-grade (best quality grade), single-component, ultra-high-performance, polymer-modified Portland cement mortar conforming to A118.15 shear bond strength requirements.
2. Application: Used for the installation of interior and exterior floor and wall vitreous, semi-vitreous or non-vitreous tile (ceramic, mosaic, quarry, and cement body tile); impervious porcelain tile; and natural stone veneer and stone tile.
3. Products: Provide one of the following, or equal.
a. “FlexBond Crack Prevention Thin-Set Mortar” manufactured by Custom Building Products.
b. “254 Platinum” manufactured by LATICRETE International, Inc.
c. “Ultraflex 3” manufactured by Mapei Corp.

E. Medium Bed Mortar Installations (horizontal applications between 3/8- and 3/4-inch thick after beat-in):
1. Description: Regular-setting, polymer-modified mortar conforming to A118.15 shear bond strength requirements.
2. Application: Used for the installation of the installation of
a. large-format dimensional tile (greater than 12 by 12 inches);
b. inconsistent thickness natural stone; and
c. tiles and pavers having slight substrate irregularity.

3. Products: Provide one of the following, or equal.
    a. “Natural Stone & Large Tile Medium Mortar” manufactured by Custom Building Products.
    b. “LATICRETE 4-XLT” manufactured by LATICRETE International, Inc.
    c. “Ultraflex LFT” manufactured by Mapei Corp.

F. Polymer-Modified Cementitious Sanded Grout:
1. Description: Premium-grade, pre-mixed, Portland cement sanded grout conforming to ANSI A118.7, and having a specifically-tailored, integrally-mixed antimicrobial agent.
2. Application: Used for typical joints between 1/8- and 1/2-inch wide.
3. Products: Provide one of the following, or equal.
    a. “Prism Ultimate Performance Grout” manufactured by Custom Building Products.
    b. “LATICRETE PermaColor” manufactured by LATICRETE International, Inc.
    c. “Ultracolor Plus FA” manufactured by Mapei Corp.
4. Colors: Indicated on the Drawings or selected by the Architect.

G. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect tile quality, durability, appearance**,** or performance.

2.4 ACCESSORIES

A. Trim Units: Coordinate with sizes and coursing of adjoining tile. Provide shapes indicated on the Drawings.

B. Grout Release:
1. Description: Temporary, water soluble, pre-grout coating.
2. Application: Used to provide protection against grout & mortar staining.
3. Products: Provide one of the following, or equal.
    a. “Aqua Mix Grout Release” manufactured by Custom Building Products.
    b. “STONETECH Grout Release” manufactured by LATICRETE International, Inc.
    c. “UltraCare Grout Release” manufactured by Mapei Corp.

C. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on the installed tile and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering tile and grout surfaces.

D. Grout Sealer: Manufacturer's standard product for sealing grout joints, which does not change either the color or appearance of installed grouts.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Site Mixing: Batch mix installation materials in conformance with manufacturer’s instructions and other requirements and recommendations, using manufacturer-recommended techniques and manufacturer-recommended mechanical mixing equipment, which must be clean and free of material from previously mixed batches before charging each subsequent batch.

1. Measure mix materials using only graduated mixing containers and calibrated mixing equipment. Shovels do not qualify as graduated mixing containers or calibrated equipment and are prohibited from measuring or dispensing mix materials.
2. Thoroughly agitate and stir mix materials to a uniform and smooth consistency suitable for proper installation.
3. Do not reduce, alter, or introduce foreign materials into mix materials, except in conformance with manufacturer’s instructions and other requirements and recommendations.
4. Do not use caked or lumpy materials; or materials that are irregular, too thick or too thin, or that are partially set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations, including dimensional tolerances and deflection criteria.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify items penetrating tile are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of installation, durability, appearance, or performance of furnished tiling.
2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with leveling and patching compound. Apply, trowel, and float patching compound to achieve smooth, flat, hard surface. Prohibit traffic until patching compound is cured.
3. Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16. Provide ICRI concrete surface profile CSP 3 to CSP 5 (light to medium shotblast between 10 and 40 mils), unless otherwise explicitly required, recommended, or accepted in writing by the waterproofing manufacturer.
4. Vacuum-clean substrate.

3.3 INSTALLATION

A. General Requirements:

1. Install tile in conformance with the specified quality standards requirements using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set tile to line; plumb, level, and square without warp or lipping; with uniform, well-fitted joints and in alignment with adjacent construction

3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed tile must be warrantable. Do not install, correct, or replace tile in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Install waterproofing/crack prevention membrane in conformance with ANSI A108.13 and the waterproofing/crack prevention manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
2. Do not install tile over waterproofing/crack prevention membrane until membrane has cured and been tested to determine that it is watertight.
3. Install tile in conformance with the ANSI and TCNA quality standard publication requirements for wall installations.
4. Accurately form intersections and returns. Perform cutting and drilling without marring visible surfaces. Carefully grind cut edges abutting trim, finishes, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
5. Jointing Pattern: Lay tile in patterns as indicated on the Drawings.
   a. Ensure tile are the same size and joints align when tile are installed against stone on floors, bases, walls, and trim.
   b. Lay out and center tile in both directions in each space or on each wall area. Adjust to minimize cutting.
   c. Provide uniform joint widths, unless otherwise indicated.
6. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, during installation..
   a. Locate joints in tile surfaces directly above joints in concrete substrates.
   b. Prepare joints and apply sealants in conformance with the requirements in Section 07 92 00.
   c. Do not saw-cut joints after installing stones
7. Thresholds: Install thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
8. Grout tile in conformance with the ANSI and TCNA quality standard publication requirements.
9. Grout Sealer: Apply grout sealer to cementitious grout joints in conformance with the grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile by wiping with soft cloth.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere tile to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible tile surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed tile in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to or against installed tile unless they are protected from damage, as accepted in writing by the Architect. Do not use installed tile as work surfaces.

C. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09- 3020

ROUTINE CLEANING AND STAIN REMOVAL OF CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. This procedure includes guidance on the routine cleaning and removal of miscellaneous stains from ceramic tile including mildew, blood, ink and beverages. This procedure may be used on both glazed or unglazed tiles.

B. See 01100-07-S for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:

1. Safety Precautions
2. Historic Structures Precautions
3. Submittals
4. Quality Assurance
5. Delivery, Storage and Handling
6. Project/Site Conditions
7. Sequencing and Scheduling
8. General Protection (Surface and Surrounding)

These guidelines should be reviewed before doing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

PART 2 - PRODUCTS

2.1 MATERIALS

NOTE: Chemical products are sometimes sold under a common name. This usually means that the substance is not as pure as the same chemical sold under its chemical name. The grade of purity of common name substances, however, is usually adequate for stain removal work, and these products should be purchased when available, as they may be less expensive. Common names are shown below by an asterisk (*).

A. All-purpose cleaner such as “Mr. Clean,” “Top Job,” “Fantastik,” “Lestoil,” or equivalent.

B. Commercial cleaner such as “Tilex,” or equivalent.

C. White vinegar

D. Non-abrasive household scouring agent such as “Ajax Liquid,” “Liquid Comet,” or“Bon Ami,” or equivalent.

E. Undiluted neutral soap such as “Ivory”, “Joy” or equivalent.

F. Household bleach:

CAUTION: Do not mix ammonia with chlorine bleaches, a poisonous gas will result! Do not use bleach on bird droppings.

1. Other chemical or common names include Sodium Hypochlorite; Bleaching solution*; Laundry bleach*; Solution of chlorinated soda*.
2. Potential Hazards: Caustic to Flesh

3. Available from chemical supply house, grocery store or supermarket, hardware store or janitorial supply distributor.
4. Trisodium Phosphate: NOTE: this chemical is banned in some states such as california. Regulatory information and alternate or equivalent chemicals may be requested from the Environmental Protection Agency (EPA regional office and/or the state office of environmental quality.)
   a. Strong base-type powdered cleaning material sold under brand names.
   b. Other chemical or common names include Sodium
   c. Orthophosphate; Tribasic sodium phosphate;
   d. Trisodium orthophosphate; TSP*; and Phosphate of soda*.
   e. Potential Hazards: CORROSIVE TO FLESH.Available from chemical supply house, grocery store or supermarket or hardware store.

G. Laundry detergent

H. Clean, potable water

2.2 EQUIPMENT

A. Clean natural fiber rags, or sponges

B. Nylon scouring pad

C. Stiff bristle brushes (no iron wire)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ceramic tile surface carefully to detect the type and cause of staining before proceeding with any cleaning operation.

3.2 ERECTION, INSTALLATION, APPLICATION

A. For Periodic Cleaning:
   1. Wipe tiles with a damp sponge and all-purpose cleaner.

      OR
   2. Spray on “Tilex” following manufacturers' instructions.

      OR
   3. Wipe tiles with a 50/50 solution of white vinegar in water.

B. For More Persistent Dirt Build-up:
   1. Scrub the surface with a nonabrasive household scouring agent.

      OR
   2. Scrub the surface with an all-purpose cleaner and a nylon scouring pad

C. For Neglected Tile Surfaces:
   1. Coat tile with an undiluted neutral soap.
   2. Allow to dry and stand for several hours.
   3. Mix additional soap with warm water and wipe over the tile surface.

4. Sprinkle the surface with scouring powder and scrub with a stiff bristle brush.
5. Thoroughly rinse the surface with clean, clear water and a sponge.
6. Dry with a clean, soft cloth or towel.

D. For Mildew or Other Miscellaneous Stains:

1. Mix 1 qt. household bleach, 3 qts. water, 3 oz. TSP and 1 oz. detergent.
2. Scrub mixture into the surface using a stiff bristle brush or nylon scrubbing pad.
3. Follow by scrubbing with a scouring powder.
4. Rinse thoroughly with clean, clear water and dry with a clean, soft cloth or towel.

END OF SETION

SECTION 09 5113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Suspended acoustical ceiling panels.
   2. Suspension system.
   3. Installation materials.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. CISCA: Ceilings & Interior Systems Construction Association.
   2. ASW: American Steel and Wire Co.
   3. SWG: Steel Wire Gauge.

B. Definitions:
   1. Manufacturer: Means the acoustical ceiling manufacturer, unless otherwise indicated.
   2. Ceiling: Means the ceiling finish and associated suspension systems.
   3. Wire Gage (Steel Wire Gage): Means the diameter of steel wire, in inches, according to dimensions established by Washburn & Moen, Roebling, or American Steel and Wire Co.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate ceiling layout and installation with adjacent construction elements that penetrate ceilings, or is supported by them, including
   1. light fixtures;
   2. HVAC equipment;
   3. fire-suppression system components;
   4. partition assemblies; and
   5. perimeter conditions.

B. Sequencing:

1. Schedule acoustical ceiling deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; and storage areas are broom- and vacuum-clean.
2. Before beginning installation, final light fixtures must be completely installed, energized, and fully illuminated to at least the same type and level of illumination, and color temperature, maintained in the room or space after the building is occupied.
3. Install acoustical ceilings only after penetrating items are installed.
4. After acoustical ceiling installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

C. Scheduling: Allow sufficient time in the construction schedule to acclimate acoustical ceilings to specified ambient conditions for at least 48 hours before installation begins.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer’s product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing acoustical ceiling layout, materials, joints, edge conditions, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.

3. Samples:
    a. Submit at least 8-inch square representative samples of each acoustical ceiling variety for each specified color and finish.
    b. Submit at least 8-inch long representative samples of each suspension system exposed tee, molding, and trim variety in each specified color and finish.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
    1. Coordination Drawings: Submit at least 1/4-inch scale dimensioned reflected ceiling plans showing the following items coordinated with each other, based on input from installers of each item involved.
        a. Ceiling suspension system members.
        b. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
        c. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
    2. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished acoustical ceilings.
        a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
        b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
    3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals:
    1. Before Final Completion, deliver to the Owner acoustical ceiling cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
    2. Furnish at least 2 percent of the total installed for each acoustical ceiling type, color, composition, grade, finish, and variety, but not less than one box or open container.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical ceilings must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Surface-Burning Characteristics: Provide acoustical ceilings having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.
2. Ceiling panels, other than acoustical panels, weighing more than 1/2-pound per square foot must be positively attached to ceiling suspension runners in conformance with California Building Code Section1616A.1.21.

C. Quality Standards

1. Seismic Standard: Provide acoustical ceilings designed and installed to withstand the effects of earthquake motions in conformance with ASCE/SEI 7, "*Minimum Design Loads For Buildings and Other Structures*"; CISCA publication, "*Seismic Construction Handbook*"; and California Building Code Sections 803.9.1.1, 1614, 1616A.1.20, and 2506.2.1.
2. Installation Standard: Comply with CISCA publication "*Ceiling Systems Handbook*" requirements for installation.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing acoustical ceilings for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing acoustical ceilings for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading acoustical ceiling installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective ceiling materials with undamaged new ceiling materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install acoustical ceilings only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING PANELS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 SUSPENSION SYSTEMS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.3 INSTALLATION MATERIALS

A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635 Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.

B. Wire: Soft temper, zinc-coated, pre-stretched, galvanized carbon steel wire conforming to ASTM A 641 Class 3 or A coating and having a minimum yield-stress load of 3 times the design load.

1. Hanger Wire: Minimum 0.106-inch diameter. (ASW12)
2. Diagonal Bracing Wire: Minimum 0.106-inch diameter. (ASW12)
3. Provide heavier gage hanger wire for ceiling systems heavier than 4 pounds per square foot.

C. Compression Struts: Provide one of the following.

1. Cold or hot rolled angles, loadbearing or non-loadbearing studs, EMT or rigid conduit, or black iron.
2. Cold-rolled steel section with maximum L/R ratio of not more than 200.

D. Engineered Compression Struts:

1. Description: Pre-engineered telescoping seismic compression posts manufactured from heavy-wall galvanized tubing.
2. Application: Manufactured compression struts may be provided in lieu of compression struts indicated above when installed in conformance with its manufacturer's instructions.
3. Products: Provide one of the following, or equal.
   a. "ARMSTRONG 5594 Ceiling Tile Compression Strut" manufactured by Armstrong World Industries, or equal.
   b. "Donn Brand Compression Post VSA" manufactured by USG Interiors, Inc. (ICC ES Report No. ESR-1222), or equal.

E. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 ACCESSORIES

A. Seismic Clips:
   1. Description: 2-inch beam end retaining clip that joins main beam or cross tee to wall molding and web of grid with no visible pop rivets.
   2. Restrictions: Use of seismic clips is permitted only when specifically detailed on the Drawings. Alternative method of construction plan-review approval is required for use of seismic clips.
   3. Products: Provide one of the following, or equal.
      a. “BERC 2” clips manufactured by Armstrong World Industries, or equal.
      b. “ACM7” clips manufactured by USG Interiors, Inc., or equal.

B. Seismic Separation Joints: Provide ceiling system manufacturer’s standard at seismic separation joints at ceiling locations where the contiguous area of non-broken ceiling is 2,500 square feet or greater.

C. Perimeter Wall Molding: Provide the following manufactured by Armstrong World Industries, or equal, with prefinished exposed flanges matching suspension system.
   1. Angle Molding: “No. 7808”, or equal, 2-inch flange by 2-inch high hemmed edge molding.
   2. Shadow Molding: “No. 7823”, or equal, 2-inch flange by 1-1/4-inch high by 3/4-inch reveal hemmed edge molding.
   3. Shadow Molding Installed with Seismic Clips:
      a. Application: Compatible with Seismic Rx and BERC 2 clips.
      b. Product: “No. 7897” 15/16-inch flange by 15/16-inch high by 1/2-inch reveal hemmed edge molding.
   4. Channel Molding: “No. 7834”, or equal, 15/16-inch flange by 1-1/4-inch high by 1/2-inch reveal hemmed edge molding.

D. Perimeter Trim: “Axiom Building Perimeter System” manufactured by Armstrong World Industries, or equal, for ACT ceiling tiles flush with adjacent gypsum board soffits.

E. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
2. Verify items penetrating acoustical ceilings are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install acoustical ceilings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed acoustical ceilings must be warrantable. Do not install, correct, or replace acoustical ceilings in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Suspend ceiling hangers from building's structural members.
   a. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   b. Do not attach hangers to steel deck tabs. Do not attach hangers to steel roof deck. Attach hangers to structural members.
2. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or ceiling suspension system.
3. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   a. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

b. Where width of ducts and other construction within ceiling plenums produce hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

c. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by the quality standard publications.

4. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

   a. Secure wire hangers to ceiling suspension members and to supports above with at least 3 tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure bracing wires to ceiling suspension members and to supports with at least 4 tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.

6. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

7. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

   a. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

   b. Mechanically-fasten moldings to substrates at intervals not more than 16 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

   c. Do not use exposed fasteners, including pop rivets, on moldings and trim.

8. Install ceiling panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

   a. Arrange directionally patterned ceiling panels as indicated on reflected ceiling plans. Install panels with pattern running in one direction parallel to short axis of space.

b. For square-edged panels, install with edges fully hidden from view by flanges of suspension system runners and moldings.
c. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by ceiling panel manufacturer.
d. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach acoustical ceilings to supporting construction.

D. Installation Tolerances: Ceilings must conform to the following tolerances, which are non-cumulative.

1. Maximum Out of Plane: Surfaces may not vary by more than 1/8-inch in 10 feet.
2. Carrying Channel Maximum Out of Level: Not more than 1/8-inch in 12 feet,
3. Main Runner Maximum Out of Level: Not more than 1/4-inch in 10 feet,
4. Main Runner Maximum Deflection: Not more than L/360 of span,
5. Maximum Misalignment of Main Runners: 0.015-inch.
6. Maximum Misalignment of Intersection Members: 0.020-inch.
7. Main Runner Bow, Camber, and Twist: Not more than 1/32-inch in 2 feet bow or camber; not more than one degree twist.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed acoustical ceilings in place from deterioration, and damage until Substantial Completion.

B. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 6262
METAL FLOORING TRANSITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal flooring transitions.
   2. Installation materials.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the flooring transition manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished flooring transitions.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner flooring transition cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish at least 2 percent of the total installed for each flooring transition type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Flooring transitions must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, transitions, and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped, upright in their original containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

1. Sheet products must be tightly rolled face out on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer
2. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.

C. Handling: Handle items in conformance with manufacturer’s instructions and other requirements and recommendations.

1. Avoid damage to containers and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective flooring transitions with undamaged new flooring transitions that do not exhibit deterioration, damage, or defects, including rolled sheet products that are flattened or distorted during shipping, unloading, or storage.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 METAL FLOORING TRANSITIONS

A. Foot Traffic Flooring transitions:

1. Description: Metal profiles designed to provide a smooth transition between tile coverings and flooring or finished concrete at lower elevations.
2. Product: “Schluter-RENO-U” manufactured by Schluter Systems, or equal.
3. Material: Stainless steel.

B. Rolling Traffic Flooring transitions:

1. Description: Metal profiles designed to provide a smooth transition between tile coverings and flooring or finished concrete at lower elevations in commercial applications where wheel carts are used.
2. Product: “Schluter-RENO-RAMP” or “Schluter-RENO-RAMP-K” manufactured by Schluter Systems, or equal.
3. Material: Anodized aluminum.

C. Edge Strips:

1. Description: L-shaped profile with 1/8-inch wide visible surface and integrated trapezoid-perforated anchoring leg and grout joint spacer.
2. Product: “Schluter-SCHIENE” or “Schluter-JOLLY” manufactured by Schluter Systems, or equal.
3. Material: Stainless steel.

D. Floor-to-Wall Transition:

1. Description: Cove-shaped profile with a single anchoring leg for inside wall corners, countertop/backsplash transitions and floor/wall transitions where limited movement is expected.
2. Product: “Schluter-DILEX-AHK” manufactured by Schluter Systems, or equal.
3. Material: Anodized aluminum.

2.2 INSTALLATION MATERIALS

A. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

B. Adhesive:

1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of installation; and for adequate bonding of flooring transitions to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected fire-resistance ratings.
2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each flooring transition application.

2.3 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with flooring transition adhesion, appearance, or performance.

C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:
   1. Install flooring transitions using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended transitions and techniques.
   2. Only install flooring transitions under conditions that ensure finishes are free from blemishes and defects.
   3. Completed work must match approved samples and mockups, as accepted by the Architect.
   4. Installed flooring transitions must be warrantable. Do not install, correct, or replace flooring transitions in a manner that results in any warranty or guarantee becoming void.
B. Special Techniques:
   1. Apply metal base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
   2. Install metal base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   3. Tightly adhere metal base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of metal base with manufacturer's recommended adhesive filler material.
C. Interface with Adjacent Items: Provide materials, components, and transitions normally furnished or necessary to securely adhere flooring transitions to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: After installation, correction, and repair are complete, remove strippable film or other temporary protection. Promptly remove from exposed metal surfaces anything that might interfere with uniform oxidation.

   1. Clean all visible flooring transition surfaces in a manner that does not result in any warranty or guarantee becoming void.
   2. Use cleaning materials and transitions supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   3. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   4. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   5. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be satisfactorily cleaned to the reasonable satisfaction of the Architect, whose decision is final.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed flooring transitions in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed flooring transitions unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed flooring transitions as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 6514

RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient wall base.
2. Resilient stair treads.
3. Installation materials.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the resilient base manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Schedule resilient base deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Final light fixtures must be completely installed and energized before beginning installation.
3. Install resilient base only after all other finishing operations are complete, especially overhead finishes.
4. After resilient base installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

B. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate resilient base and installation materials to specified ambient conditions for at least 48 hours before installation begins.
2. Primer Installation: Resilient base must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer’s instructions for re-priming.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished resilient base and accessories.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner resilient base cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish at least 2 percent of the total installed for each resilient base type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Resilient base must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Surface-Burning Characteristics: base having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

2. Radiant Flux Classification: resilient accessories having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.

C. Qualifications:

1. Installer: Company or individuals must have experience installing resilient base forat previous projects similar to this project in size, material, design, and complexity.

2. Supervisors: Individuals must have experience installing resilient base.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped, upright in their original containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas. Promptly remove and replace rolled products that are flattened or distorted during shipping, unloading, or storage.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations.

1. Avoid damage to containers and contamination of contents.

2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective resilient base with undamaged new resilient base that do not exhibit deterioration, damage, or defects, including rolled sheet products that are flattened or distorted during shipping, unloading, or storage.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install resilient base only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving resilient base must be dry. Install resilient base only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.

2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.

3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

C. Other Conditions: Do not apply resilient base where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 RESILIENT STAIR TREADS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.3 INSTALLATION MATERIALS

A. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

B. Adhesive:

1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of installation; and for adequate bonding of resilient base to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each resilient base type and application.

3. Provide hard-set adhesive supplied, required, recommended, or accepted by the manufacturer under resilient base subject to concentrated static or dynamic rolling loads.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations. Verify wall surfaces and flooring are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with resilient base adhesion, appearance, or performance.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install resilient base using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install resilient base under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed resilient base must be warrantable. Do not install, correct, or replace resilient base in a manner that results in any warranty or guarantee becoming void.

B. Resilient Base Special Techniques:

1. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
2. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
3. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
4. Do not stretch resilient base during installation.

5. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
6. Use straight pieces of maximum lengths possible to form corners; form without producing discoloration (whitening) at bends.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere resilient base to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible resilient base surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect’s acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed resilient base in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed resilient base unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed resilient base as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 6519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Surface preparation.
   3. Installation materials.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 05 16 for preparation of concrete slabs for finish flooring; and for remedial MVER products.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. ICRI: International Concrete Repair Institute, Inc.
   2. MVER: Moisture Vapor Emission Rate.
   3. RFCI: Resilient Floor Covering Institute.

B. Definitions:
   1. Manufacturer: Means the resilient tile flooring manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Concrete Substrates:
      a. Verify chemical and adhesive compatibility of selected flooring adhesives with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
      b. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the flooring manufacturer.

2. Wood Substrates: Verify all wood sub floors are double-layer construction, are suspended at least 18 inches above grade, and have adequate cross-ventilation.

B. Preinstallation Meeting:

1. Resilient tile flooring manufacturer's representative and installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, resilient tile flooring manufacturer's representatives and installers, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including subfloor surface flatness and levelness, and special details and conditions that might affect installation.
5. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed resilient tile flooring. Resolve each condition.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:

1. Schedule resilient tile flooring deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install resilient tile flooring only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with resilient tile flooring adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install resilient tile flooring only after penetrating items are installed.

5. Install resilient tile flooring only after all other finishing operations are complete, especially overhead finishes.
6. After resilient tile flooring installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

D. Scheduling:
1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Acclimation: Allow sufficient time in the construction schedule to acclimate resilient tile flooring and installation materials to specified ambient conditions for at least 48 hours before installation begins.
3. Primer Installation: Resilient tile flooring must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
4. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing resilient tile flooring custom patterns and inlays, and seam layouts.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
3. Samples: Submit at least 8-inch square representative samples of each resilient tile flooring color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished resilient tile flooring.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
C. Closeout Submittals: Submit copies of manufacturer's instructions and other requirements and recommendations for resilient tile flooring maintenance, cleaning, and repair to the Architect as a condition of project closeout.
D. Maintenance Material Submittals:
   1. Before Final Completion, deliver to the Owner resilient tile flooring cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
   2. Furnish at least 2 percent of the total installed for each resilient tile flooring type, color, composition, grade, finish, and variety, but not less than one unopened box or container.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Resilient tile flooring must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Resilient tile flooring must be stable, firm, and slip resistant, conforming to the requirements of California Building Code Section 11B-302.1
2. Radiant Flux Classification: Provide resilient tile flooring having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
3. Allowable Static Coefficient of Friction Value (SCOF): At least 0.6 for level surfaces and at least 0.8 for sloped surfaces, when measured in conformance with ASTM D 2047.
4. Allowable Dynamic Coefficient of Friction Value (DCOF): Between 0.35 and 0.45, when measured in conformance with ANSI B101.3 under wet conditions.

C. Quality Standards:

1. Resilient Tile Flooring Installation Standard: Comply with Resilient Floor Covering Institute publication RFCI IP #2, "*Recommended Installation Practice for Vinyl Composition Tile (VCT)*" requirements that apply to each in-service condition indicated.
2. Material Standard: Resilient tile flooring must be independently tested and certified by Scientific Certification Systems (SCS) in conformance with FloorScore requirements for indoor air quality emissions.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing resilient tile flooring for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing resilient tile flooring for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading resilient tile flooring installers.

E. Custom Patterns and Inlays: Resilient tile flooring must be laser-cut. Field cutting is prohibited.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
   1. Furnish adequate dunnage and bracing during storage.
   2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
   3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective resilient tile flooring materials with undamaged new resilient tile flooring materials that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install resilient tile flooring only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
B. Existing Conditions:
   1. Surface Conditions: Surfaces receiving resilient tile flooring must be dry. Install resilient tile flooring only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
   2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
   3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

PART 2 - PRODUCTS

2.1 RUBBER TILE FLOORING

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 SURFACE PREPARATION

A. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.

2.3 INSTALLATION MATERIALS

A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Moisture Vapor Transmission Reduction Coating: Specified in Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.

C. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

D. Adhesive:

1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of resilient tile flooring installation; and for adequate bonding of resilient tile flooring to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each resilient tile flooring type and application.

3. Provide hard-set adhesive supplied, required, recommended, or accepted by the manufacturer under resilient tile flooring subject to concentrated static or dynamic rolling loads.

2.4 ACCESSORIES

A. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on the installed resilient tile flooring and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering resilient tile flooring surfaces.

B. Floor Polish: Protective liquid polish products supplied, required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with resilient tile flooring adhesion, appearance, or performance.
4. Verify items penetrating resilient tile flooring are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and resilient tile flooring installation. Control and collect dust produced by grinding operations.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage, and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, appearance, or performance of either the furnished resilient tile flooring or adhesives.
2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with patch and fill materials. Apply, trowel, and float patch material to achieve smooth, flat, hard surface. Prohibit traffic until patch material is cured.
3. Perform testing, corrective work, and substrate preparation specified in Section 09 05 16.
4. Vacuum-clean substrate.

C. Bond Test: Perform and document bond tests as required, recommended, or accepted by the manufacturer, must be performed and documented before beginning installation.

3.3 INSTALLATION

A. General Requirements:

1. Install resilient tile flooring using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install resilient tile flooring under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed resilient tile flooring must be warrantable. Do not install, correct, or replace resilient tile flooring in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Scribe, cut, and fit resilient tile flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
2. Extend resilient tile flooring into toe spaces, door reveals, closets, and similar openings. Extend resilient tile flooring to centerline of doors in the closed position.
3. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient tile flooring as marked on substrates. Use pencil, chalk, or other nonpermanent, non-staining marking device. The use of markers is prohibited.

4. Adhere resilient tile flooring to substrate using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere resilient tile flooring to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible resilient tile flooring surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed resilient tile flooring in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed resilient tile flooring unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed resilient tile flooring as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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B. Preinstallation Meeting:

1. Carpet manufacturer's representative and installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, carpet manufacturer's representatives and installers, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including subfloor surface flatness and levelness, and special details and conditions that might affect installation.
5. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed carpet. Resolve each condition.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:

1. Schedule carpet deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install carpet only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with carpet adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install carpet only after penetrating items are installed.

5. Install carpet only after all other finishing operations are complete, especially overhead finishes.
6. After carpet installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

D. Scheduling:
1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Acclimation: Allow sufficient time in the construction schedule to acclimate carpet and installation materials to specified ambient conditions for at least 48 hours before installation begins.
3. Primer Installation: Carpet must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
4. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing carpet and seam layouts.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
3. Samples: Submit at least 8-inch square representative samples of each carpet color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished carpet.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
C. Maintenance Material Submittals:
   1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
   2. Furnish at least 2 percent of the total installed for each carpeting type, color, composition, grade, finish, and variety, but not less than one unopened gallon or container.
   3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of carpet surfaces, including a comprehensive list of known chemicals that should not come into contact with carpet surfaces.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Carpet must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Radiant Flux Classification: Provide carpet having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
2. Carpeting must conform to the requirements of California Building Code Section 11B-302.2
3. Carpet must be securely attached and must have a firm cushion, pad, or backing or no cushion or pad. It must have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height must be 1/2-inch maximum.
4. Exposed edges must be fastened to floor surfaces and must have trim on the entire length. Carpet edges must conform to the requirements of California Building Code Section 11B-303.

C. Quality Standards:

1. Installation Standard: Comply with The Carpet and Rug Institute publication CRI 104, "*Standard for Installation of Commercial Carpet*" requirements that apply to each in-service condition indicated.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing carpet for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing carpet for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading carpet installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.

2. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective carpeting with undamaged new carpeting that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install carpet only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving carpet must be dry. Install carpet only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer..
2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

PART 2 - PRODUCTS

2.1 COMMERCIAL TILE CARPETING

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 SURFACE PREPARATION

A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Moisture Vapor Transmission Reduction Coating: Specified in Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.

C. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.

2.3 INSTALLATION MATERIALS

A. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

B. Adhesive:

1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of carpet installation; and for adequate bonding of carpet to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each carpet type and application.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with [flooring] adhesion, appearance, or performance.
4. Verify items penetrating [flooring] are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and carpet installation. Control and collect dust produced by grinding operations.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, appearance, or performance of either the furnished resilient flooring or adhesives.
2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with patch and fill materials. Apply, trowel, and float patch material to achieve smooth, flat, hard surface. Prohibit traffic until patch material is cured.

3. Test substrates for alkalinity (pH), MVER, and relative humidity (RH) and perfrom corrective work, and substrate preparation as specified in Section 09 05 16 and required by the manufacturer.
4. Vacuum-clean substrate.

C. Bond Test: Perform and document bond tests as required, recommended, or accepted by the manufacturer, must be performed and documented before beginning installation.

3.3 INSTALLATION

A. General Requirements:
1. Install carpet using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install carpet under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed carpet must be warrantable. Do not install, correct, or replace carpet in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
1. Scribe, cut, and fit carpet to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
2. Extend carpet into toe spaces, door reveals, closets, and similar openings. Extend carpet to centerline of doors in the closed position.
3. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on substrates. Use pencil, chalk, or other nonpermanent, non-staining marking device. The use of markers is prohibited.
4. Adhere carpet to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere carpet to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, and soiling from all visible carpet surfaces in a manner that does not result in any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed flooring in place from soiling, deterioration, and damage until Substantial Completion. Poly-Tak Surface-Shields, Carpet Mask, and similar masking systems are prohibited.

B. Do not store anything on, adjacent to, or against installed carpet unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed carpet as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 6817
COMMERCIAL SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Commercial broadloom carpeting.
   2. Carpet cushion.
   3. Surface preparation.
   4. Installation materials.
   5. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 05 16 for preparation of concrete slabs for finish carpet; and for remedial MVER products.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. CRI: The Carpet and Rug Institute, Inc.
   2. ICRI: International Concrete Repair Institute, Inc.
   3. MVER: Moisture Vapor Emission Rate.

B. Definitions:
   1. Manufacturer: Means the carpet manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify chemical and adhesive compatibility of selected carpet adhesives with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
   2. Coordinate existing concrete subfloor surface flatness and levelness with ACI 117 requirements, measured in conformance with ASTM E 1155 (3D laser scanning or Allen Face F-Meter methods), and tolerances required, recommended, or accepted by the flooring manufacturer.

B. Preinstallation Meeting:

1. Carpet manufacturer's representative and installer must attend the preinstallation meeting.
2. Schedule a separate additional preinstallation meeting between the Contractor, the Architect, carpet manufacturer's representatives and installers, and the entities and individuals responsible for conducting concrete substrate testing.
3. Hold the meeting after submittal approval and at least 10 business days before beginning installation.
4. During the meeting, review the Contract Documents, submittals, project conditions, and installation sequence and methods, including subfloor surface flatness and levelness, and special details and conditions that might affect installation.
5. Identify and discuss adverse or unfavorable conditions detrimental to protecting stored materials or to installation; or to the quality, durability, appearance, or performance of installed carpet. Resolve each condition.
6. Finalize construction schedule.
7. Record significant discussions and distribute meeting minutes. Do not begin installation until disagreements are successfully resolved to the satisfaction of all parties.

C. Sequencing:

1. Schedule carpet deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install carpet only after substrate is cured to a condition of equilibrium; is sufficiently dry to bond with carpet adhesives; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer. Provide chemically and adhesively compatible treatment when required or necessary to reduce pH and MVER to within allowable limits required, recommended, or accepted by the manufacturer.
3. Final light fixtures must be completely installed and energized before beginning installation.
4. Install carpet only after penetrating items are installed.

5. Install carpet only after all other finishing operations are complete, especially overhead finishes.
6. After carpet installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

D. Scheduling:
1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.
2. Acclimation: Allow sufficient time in the construction schedule to acclimate carpet and installation materials to specified ambient conditions for at least 48 hours before installation begins.
3. Primer Installation: Carpet must be applied within 24 hours of primer installation. Re-prime surfaces exposed for more than 24 hours; follow manufacturer's instructions for re-priming.
4. Access Restrictions: Close spaces during installation; keep closed to foot traffic after installation for at least 48 hours and to rolling traffic for at least 72 hours.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing carpet and seam layouts.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
3. Samples:
   a. Submit at least 8-inch square representative samples of each carpet color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished carpet.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
      b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
   2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.
C. Maintenance Material Submittals:
   1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
   2. Furnish at least 2 percent of the total installed for each carpeting type, color, composition, grade, finish, and variety, but not less than one unopened gallon or container.
   3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of carpet surfaces, including a comprehensive list of known chemicals that should not come into contact with carpet surfaces.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Carpet must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Radiant Flux Classification: Provide carpet having an average critical radiant flux value of at least 0.45 (Class I), when tested in conformance with ASTM E 648.
2. Carpeting must conform to the requirements of California Building Code Section 11B-302.2
3. Carpet must be securely attached and must have a firm cushion, pad, or backing or no cushion or pad. It must have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height must be 1/2-inch maximum.
4. Exposed edges must be fastened to floor surfaces and must have trim on the entire length. Carpet edges must conform to the requirements of California Building Code Section 11B-303.

C. Quality Standards:

1. Installation Standard: Comply with The Carpet and Rug Institute publication CRI 104, "*Standard for Installation of Commercial Carpet*" requirements that apply to each in-service condition indicated.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing carpet for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing carpet for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading carpet installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas. Furnish adequate dunnage and bracing during storage.

1. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.

2. Sheet products must be tightly rolled on a sturdy core designed for that purpose and vertically stored unless otherwise required or recommended by the manufacturer. Promptly remove and replace rolled sheet products that are flattened or distorted during shipping, unloading, or storage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective carpeting with undamaged new carpeting that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install carpet only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:
1. Surface Conditions: Surfaces receiving carpet must be dry. Install carpet only when substrate moisture content, vapor emission rate, and surface temperature fall within ranges required, recommended, or accepted by the manufacturer..
2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same type, illumination level, and color temperature maintained in the room or space after the building is occupied.

PART 2 - PRODUCTS

2.1 COMMERCIAL BROADLOOM CARPETING

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 CARPET CUSHION

A. Product: Provide the following manufactured by Sponge Cushion, Inc., or equal.
   1. Assembly Areas (Extra-Heavy Traffic Classification): “Tred-MOR 2580”, or equal.
   2. Public Areas (Heavy Traffic Classification): “Tred-MOR 2568”, or equal.

B. Requisite Properties:
   1. Material Weight:
      a. Extra-Heavy Traffic Classification: At least 80 ounces per square yard.
      b. Heavy Traffic Classification: At least 65 ounces per square yard.
   2. Density:
      a. Extra-Heavy Traffic Classification: At least 25 pounds per cubic foot.
      b. Heavy Traffic Classification: At least 20 pounds per cubic foot.
   3. Thickness: 0.25-inch.

2.3 SURFACE PREPARATION

A. Trowelable Patch and Fill Materials: Specified in Section 03 54 16, unless other products are supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Moisture Vapor Transmission Reduction Coating: Specified in Section 09 05 16 (remedial), unless another coating is supplied, required, recommended, accepted by the by manufacturer for actual in-service conditions applicable to the project.

C. Substrate Testing and Surface Preparation: Perform testing and corrective work and prepare substrates in conformance with the requirements of Section 09 05 16.

2.4 INSTALLATION MATERIALS

A. Primer: Water-based, low- or zero-VOC, solvent-free primer supplied, required, recommended, or accepted by the manufacturer for in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.

B. Adhesive:

1. Water-based, low- or zero-VOC adhesive supplied, required, recommended, or accepted by the manufacturer for ease of carpet installation; and for adequate bonding of carpet to substrates for all in-service installation conditions, including temperature, relative humidity, and substrate porosity; and expected foot traffic, rolling traffic, and fire-resistance ratings.
2. Wet-tack, percent solids, open-time, stripability, and ease of application must be explicitly formulated for each carpet type and application.

2.5 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
2. Verify subfloor surfaces are properly secured, smooth, and flat to minimum floor flatness and levelness tolerances required, recommended, or accepted by the manufacturer for the actual in-service conditions applicable to the project.
3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with [flooring] adhesion, appearance, or performance.
4. Verify items penetrating [flooring] are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and carpet installation. Control and collect dust produced by grinding operations.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage; and from detrimental effects caused by surface profiling operations. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

1. Remove substrate coatings and other substances that are incompatible with adhesives or that may negatively affect the quality of the installation, durability, appearance, or performance of either the furnished resilient flooring or adhesives.
2. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with patch and fill materials. Apply, trowel, and float patch material to achieve smooth, flat, hard surface. Prohibit traffic until patch material is cured.
3. Test substrates for alkalinity (pH), MVER, and relative humidity (RH) and perfrom corrective work, and substrate preparation as specified in Section 09 05 16 and required by the manufacturer.
4. Vacuum-clean substrate.

C. Bond Test: Perform and document bond tests as required, recommended, or accepted by the manufacturer, must be performed and documented before beginning installation.

3.3 INSTALLATION

A. General Requirements:

1. Install carpet using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install carpet under conditions that ensure finishes are free from blemishes and defects.
3. Completed work must match approved samples and mockups, as accepted by the Architect.
4. Installed carpet must be warrantable. Do not install, correct, or replace carpet in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Scribe, cut, and fit carpet to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
2. Extend carpet into toe spaces, door reveals, closets, and similar openings. Extend carpet to centerline of doors in the closed position.
3. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on substrates. Use pencil, chalk, or other nonpermanent, non-staining marking device. The use of markers is prohibited.
4. Adhere carpet to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely adhere carpet to supporting construction.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, and soiling from all visible carpet surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed flooring in place from soiling, deterioration, and damage until Substantial Completion. Poly-Tak Surface-Shields, Carpet Mask, and similar masking systems are prohibited.

B. Do not store anything on, adjacent to, or against installed carpet unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed carpet as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 8133
ACOUSTICAL INSULATION, SEALANTS, AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concealed acoustical insulation.
2. Acoustical sealants.
3. Acoustical spray.
4. Firestop and acoustical putty pads.
5. Installation materials.
6. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the acoustical insulation or accessory manufacturer, as the context admits, manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. CPVC Coordination: Not all CPVC products are identical. Different CPVC products from different manufacturers may vary in molecular weight, chlorine content and compound additives.

1. Verify selected CPVC product combability with all products that may come into contact with selected CPVC, even if contact is inadvertent.
2. Determine chemical composition of CPVC materials and compatibility of selected paints and sealants with selected CPVC materials.
3. Only apply ancillary products that are specifically approved for use on the specific brand of CPVC selected for the project.
4. If an ancillary product is not on a compatibility list, contact the CPVC manufacturer before use. Never assume the absence of a prohibition indicates suitability.
5. Natural oil (vegetable oil or animal fat) and synthetic ester oils, or items containing natural or synthetic oil are prohibited from contacting CPVC.
6. Plasticizers found in certain materials, including incompatible sealants, are prohibited from contacting CPVC.

7. Surfactants found in certain materials, including soaps and detergents, are prohibited from contacting CPVC.
8. Fungicides sprayed on surrounding drywall and wood framing to prevent growth of mold and mildew, are prohibited from contacting CPVC.
9. Scented products, including cologne, perfume, or essential oils (e.g., peppermint oil, orange oil, spearmint oil, etc.), are prohibited from contacting CPVC. (Sometimes used for the purpose of being able to detect leaks by odor)
10. Jacketing on signal-carrying wiring systems often contains plasticizers that are prohibited from contacting CPVC.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Submit manufacturer-prepared published instructions for proper installation of furnished insulation.
   2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items as shipped, upright in their original containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

C. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 PROJECT CONDITIONS

A. Existing Conditions: Surfaces receiving acoustical insulation must be dry.

PART 2 - PRODUCTS

2.1 CONCEALED ACOUSTICAL INSULATION

A. Acoustical Blanket Insulation:

1. Description: Unfaced inorganic glass-fiber blanket acoustical insulation conforming to ASTM C 665 Type I acoustical insulation (blankets without membrane coverings).
2. Manufacturers: Provide one of the following, or equal.
   a. “CertaPro AcoustaTherm” manufactured by CertainTeed Corp.
   b. “Sound Control Batts” manufactured by Johns Manville.
   c. “Sound Attenuation Batts/MW” manufactured by Owens Corning Fiberglass Corp.

B. Sound Attenuating Fire Blanket Insulation:

1. Description: Asbestos-free mineral fiber blanket acoustical insulation conforming to ASTM C 665 requirements for Type I acoustical insulation (blankets without membrane coverings), manufactured from slag and naturally occurring rock.
2. Products: Provide one of the following, or equal.
   a. “FIBREX Sound Attenuation Fire Batt Acoustical insulation (SAFB)” manufactured by Fibrex Insulations Inc.
   b. “Thermafiber Sound Attenuating Fire Blankets (SAFB)” manufactured by Owens Corning.
   c. “ROCKWOOL AFB” manufactured by Roxul Inc.

2.2 ACOUSTICAL SEALANTS

A. Latex Sealants:

1. Description: Non-sag, paintable, non-staining siliconized acrylic-latex sealant conforming to ASTM C 834 requirements for Type OP (opaque sealant), Grade NF (does not meet the requirements for low temperature flexibility of Grade 0°C classification). Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
2. Application: Used where indicated at exposed and concealed joints and annular spaces around through-penetrations.
3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
   a. “CP 506 Smoke and Acoustic Sealant” manufactured by Hilti, Inc.
   b. “QuietZone Acoustic Sealant” manufactured by Owens Corning.
   c. “AC-20 FTR” manufactured by Pecora Corp.
   d. “Tremflex 834” manufactured by Tremco, Inc.
   e. “Sheetrock Acoustical Sealant” manufactured by USG Corp.
4. Requisite Properties:
   a. Color: White.

B. Non-Drying, Non-Hardening, Non-Skinning Sealants:

1. Description: Single-component butyl rubber sound dampening elastomeric sealant conforming to ASTM Standard D 217. Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
2. Application: Installed at concealed joints where indicated.
3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
   a. “BA-98” manufactured by Pecora Corp.
   b. “QuietSeal Acoustical Sealant QS-350” manufactured by Serious Materials, Inc.
   c. “Acoustical Sealant” manufactured by Tremco, Inc.

C. Fire Rated, Non-Hardening,, Sealant:

1. Description: Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe.
2. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
   a. “Fire Barrier 2001 Silicone RTV Foam” manufactured by 3M.
   b. “CP 601S Elastomeric Firestop Sealant” manufactured by HILTI.
   c. “Firetemp CI Caulk” manufactured by Johns Manville.
   d. “Spec Seal ES100” manufactured by Specified Technologies, Inc.

D. Expanding Foam Sealant:
   1. Description: Gun-applied, expanding spray foam sealant. Verify material compatibility with adjacent materials such as chlorinated polyvinyl chloride (CPVC) pipe
   2. Application: Used to seal and insulate around common areas of energy loss, including foundation/sill plates, outdoor fixtures, pipe penetrations, etc.
   3. Products: Unless another type is required, recommended, or accepted by the CPVC item manufacturer, provide one of the following, or equal.
      a. “GREAT STUFF PRO Gaps & Cracks” manufactured by The Dow Chemical Co.
      b. “Polycell” manufactured by M-D Building Products, Inc.
      c. “Expanding Foam Polyfilla” manufactured by Polyfilla.
E. Cementitious Sealant: “Monokote Z-146” manufactured by GCP Applied Technologies, Inc., or equal.
F. Preformed Tape Sealants:
   1. Fire-Resistance Rated Conditions:
      a. Description: Compressible, self-extinguishing, UL-listed closed cell polyvinyl chloride foam tape with pressure sensitive adhesive.
      b. Application: Installed at concealed joints in fire-resistance rated construction, where indicated.
      c. Product: “Norseal V740FR” manufactured by Norton Performance Plastics Corp., or equal.
      d. Requisite Properties:
         1) Size: One-inch minimum roll width, unless another width is indicated on the Drawings.
         2) Thickness: At least 1/8-inch, unless another thickness is indicated on the Drawings.
         3) Density: At least 9 pounds per cubic foot.
         4) Facing: Furnish tape in rolls with protective release liner on non-adhesive face.
   2. Elsewhere:
      a. Description: Compressible, closed cell polyvinyl chloride foam tape with pressure sensitive adhesive.
      b. Application: Installed at concealed joints, where indicated.
      c. Product: “Norseal V730” manufactured by Norton Performance Plastics Corp., or equal.
      d. Requisite Properties:
         1) Size: One-inch minimum roll width.
         2) Thickness: At least 3/8-inch.

3) Density: At least 6 pounds per cubic foot.
4) Facing: Furnish tape in rolls with protective release liner on non-adhesive face.

2.3 ACOUSTICAL SPRAY

A. Description: Sprayable acrylic latex material.
B. Application: Used where indicated at exposed and concealed static or minimally dynamic joints or gaps in wall construction.
C. Products: Provide one of the following, or equal.
   1. “CP 572 Smoke and Acoustic Spray” or “CFS-SP WB Firestop Joint Spray” manufactured by Hilti, Inc.
   2. “Spec Seal Smoke ‘N’ Sound Sealant” manufactured by Specified Technologies, Inc.
   3. “TREMstop Smoke & Sound Sealant” or “TREMstop Acrylic” manufactured by Tremco, Inc.
D. Requisite Properties:
   1. Spray must be mold and mildew resistant in conformance with ASTM G21.
   2. Spray must have a minimum movement capability of at least 12.5 percent.

2.4 FIRESTOP AND ACOUSTICAL PUTTY PADS

A. Description: Sound deadening pads.
B. Application: Used to seal the external surfaces (back side) of metallic and nonmetallic switch and receptacle boxes to reduce airborne sound transmission in interior partitions.
C. Fire-Resistance Rated Construction (Firestop Putty Pads): Provide one of the following, or equal.
   1. “CP 617 Firestop Putty Pads” manufactured by Hilti, Inc.
   2. “Putty Pads” manufactured by International Protective Coatings
   3. “Type FSP Firestop Putty” pads by Nelson Electric.
   4. “Putty Pads” manufactured by Specified Technologies, Inc.
   5. “TREMstop MP” manufactured by Tremco, Inc.
D. Elsewhere (Acoustical Putty Pads): Provide one of the following, or equal.
   1. “Lowry Box Pads” manufactured by Henry A. Lowry Co.
   2. “Sound Pad #68” manufactured by LH Dottie Co.

2.5 INSTALLATION MATERIALS

A. Acoustical Insulation Hangers:

1. Application: Used to attach acoustical insulation to clean, dry, smooth, non-porous solid surfaces.
2. Manufacturer: Provide products manufactured by AGM Industries, Inc., or equal.
3. Products: Provide the following, or equal.
   a. Anchors: “TACTOO Insul-Hangers” adhesively attached spindle-type anchors.
   b. Adhesive: “BOSS 348 Multi-Purpose Construction Adhesive” manufactured by Accumetric, LLC or other VOC-compliant acoustical insulation hanger adhesive.
   c. Acoustical insulation Standoff: One-inch “Clutch Clip”.
   d. Acoustical insulation Retaining Washers: “Style RC 200” round or “SC 250” square washers.
4. Requisite Properties:
   a. Base Plate and Acoustical insulation Standoff and Retaining Washers: At least 2-inch square by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
   b. Retaining Washers: At least 1-1/2-inch square or diameter by at least 0.149-inch (MSG 28) base metal thickness galvanized perforated steel sheet.
   c. Spindle: At least 0.106-inch diameter (SWG 12), zinc-coated wire, depth to suit depth of acoustical insulation indicated.
   d. Adhesive: Adhesive used with impaling pins must either be manufactured or accepted by the acoustical insulation hanger manufacturer. “Peel and press” hangers with self-adhering adhesive backings are prohibited.

B. Mechanical Fasteners: Tape, staples, and other devices for fastening acoustical insulation supplied, required, recommended, or accepted by the acoustical insulation manufacturer.

C. Hanger Wire: At least 0.106-inch diameter (SWG 12) soft temper zinc-coated wire conforming to ASTM A 641, Class 3 or A coating.

D. Adhesive: Supplied, require, recommended, or accepted by the acoustical insulation manufacturer to bond acoustical insulation securely to substrates indicated without damaging acoustical insulation or substrates.

2.6 ACCESSORIES

A. Joint Backing:

1. Description: Extruded closed-cell polyethylene foam cylindrical sealant backings conforming to ASTM C 1330, Type C.

2. Products: Provide one of the following, or equal.
    a. “Mile High Foam” manufactured by Backer Rod Mfg. Inc.
    b. “HBR” or “Green Rod” manufactured by Nomaco, Inc.
    c. “NuFlex 870” manufactured by TVM Building Products.
3. Performance Requirements:
    a. Maximum Water Absorption: Not more than 0.10 grams per cubic centiliter when tested in conformance with conformance with ASTM C 1016, Procedure B.
    b. Minimum Density: At least 24 per cubic meter when tested in conformance with conformance with ASTM D 1622.
    c. Maximum Outgassing: Less than 1 bubble when tested in conformance with conformance with ASTM D 1253.
    d. Minimum Compression Recovery: At least 90 percent, when tested in conformance with conformance with ASTM D 5249.
    e. Minimum Compression Deflection: At least 20.5 percent, when tested in conformance with conformance with ASTM D 5249.
    f. Minimum Tensile Strength: At least 200 kPa, when tested in conformance with conformance with ASTM D 1623.

B. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
    1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
    2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install acoustical insulation using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Extend acoustical insulation to envelop entire area insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
3. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of acoustical insulation to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
4. Installed acoustical insulation must be warrantable. Do not install, correct, or replace acoustical insulation in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Wall Insulation:
   a. Install acoustical insulation in cavities formed by framing members.
   b. Use acoustical insulation that fills the cavities. If more than one length is required to fill the cavities, then provide lengths that will produce a snug fit between ends.
   c. Place acoustical insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   d. Maintain 3-inch clearance around recessed lighting fixtures not rated for or protected from contact with acoustical insulation.
   e. Stuff loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to roughly 40 percent of normal maximum volume.
   f. For metal-framed wall cavities higher than 96 inches, support unfaced blankets mechanically and support faced blankets by taping insulation flanges to metal stud flanges.
2. Ceiling Insulation:
   a. Install blanket acoustical insulation above ceilings where indicated.
   b. Maintain 3-inch clearance of acoustical insulation around recessed lighting fixtures.

3. Acoustical Sealant Installation:
    a. At sound-rated assemblies and elsewhere indicated, seal construction in conformance with ASTM C 919 with a continuous bead of acoustical sealant at perimeter, behind control joints, and at openings and penetrations.
    b. Install acoustical sealant to both faces of partitions at perimeters and through penetrations.

C. Acoustical Installation Requirements:
1. Application: Apply acoustical sealant where shown on drawings and the following.
    a. Both sides and perimeter of door and window frames.
    b. Penetrations of partitions, floors, and ceilings by piping, ventilation ducts, conduits, cables, and cable trays.
    c. Perimeter and between joints of all sound isolating partitions, floors, and ceilings.
2. Acoustical Sealant:
    a. Use continuous beads of acoustical sealant along gypsum board face layer to seal assemblies at head, sill, perimeter, and penetrations, and joints between layers of sound isolating gypsum board construction and around the perimeter of resilient ceilings.
    b. Comply with ASTM C 919 requirements for use of joint sealants in acoustical applications as applicable to materials and conditions indicated.
3. Sheet Sealant:
    a. In fall full height, sound rated, and sound sensitive walls, over back and sides of all electrical, telephone, and communication boxes with specified acoustical pads.
    b. Verify unused knockouts are plugged before installing the pads. Mold pads tightly to the boxes and to the adjacent surfaces.
4. Installation:
    a. To seal gaps 3/8-inch in dimension and larger, pack with glass/mineral fiber batt prior to installing sealant materials.
    b. Use compressible closed-cell foam backer rod as required. Uncompressed backer rod width should be 30 to 50 percent greater than joint width.

D. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach acoustical insulation to supporting construction.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed acoustical insulation in place from becoming wet, deterioration, and damage until covering.

B. Do not store anything adjacent to or against installed acoustical insulation unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed acoustical insulation as work surfaces.

C. Remove protection when it's no longer needed and before covering.

END OF SECTION

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SECTION 09 8415
ACOUSTICAL CEILING BAFFLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suspended acoustic baffles.
2. Supporting framework.
3. Installation materials.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the ceiling baffle manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate ceiling layout and installation with adjacent construction elements that penetrate ceilings, or is supported by them, including

1. light fixtures;
2. HVAC equipment;
3. fire-suppression system components;
4. partition assemblies; and
5. perimeter conditions.

B. Sequencing:

1. Schedule ceiling baffle deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; and storage areas are broom- and vacuum-clean.
2. Before beginning installation, final light fixtures must be completely installed, energized, and fully illuminated to at least the same type and level of illumination, and color temperature, maintained in the room or space after the building is occupied.
3. Install ceiling baffles only after penetrating items are installed.

4. After ceiling baffle installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

C. Scheduling: Allow sufficient time in the construction schedule to acclimate ceiling baffles to specified ambient conditions for at least 48 hours before installation begins.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing ceiling baffle layout, materials, joints, edge conditions, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans.
3. Samples: Submit at least 8-inch square representative samples of each ceiling baffle variety for each specified color and finish.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Coordination Drawings: Submit at least 1/4-inch scale dimensioned reflected ceiling plans showing the following items coordinated with each other, based on input from installers of each item involved.
   a. Ceiling suspension system members.
   b. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   c. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

2. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished acoustical ceilings.
    a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
    b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
3. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals:
1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish at least 2 percent of the total installed for each ceiling baffle type, color, composition, grade, finish, and variety, but not less than one box or open container.

1.5 QUALITY ASSURANCE

A. Source Limitations:
1. Ceiling baffles must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
    a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
    b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
1. Surface-Burning Characteristics: Provide ceiling baffles having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

C. Quality Standards

1. Seismic Standard: Provide ceiling baffles designed and installed to withstand the effects of earthquake motions in conformance with ASCE/SEI 7, "*Minimum Design Loads For Buildings and Other Structures*"; CISCA publication, "*Seismic Construction Handbook*"; and California Building Code Sections 803.9.1.1, 1614, and 2506.2.1.
2. Installation Standard: Comply with CISCA publication "*Ceiling Systems Handbook*" requirements for installation.

D. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing ceiling baffles for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing ceiling baffles for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading ceiling baffle installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective ceiling materials with undamaged new ceiling materials that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install ceiling baffles only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING BAFFLES

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 SUSPENSION SYSTEMS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.3 ACCESSORIES

A. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.

B. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
2. Verify items penetrating ceiling baffles are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install ceiling baffles using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed ceiling baffles must be warrantable. Do not install, correct, or replace ceiling baffles in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach ceiling baffles to supporting construction.

C. Installation Tolerances: Ceilings must conform to the following tolerances, which are non-cumulative.

1. Maximum Out of Plane: Surfaces may not vary by more than 1/8-inch in 10 feet.
2. Carrying Channel Maximum Out of Level: Not more than 1/8-inch in 12 feet,
3. Main Runner Maximum Out of Level: Not more than 1/4-inch in 10 feet,
4. Main Runner Maximum Deflection: Not more than L/360 of span,

5. Maximum Misalignment of Main Runners: 0.015-inch.
6. Maximum Misalignment of Intersection Members: 0.020-inch.
7. Main Runner Bow, Camber, and Twist: Not more than 1/32-inch in 2 feet bow or camber; not more than one degree twist.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed ceiling baffles in place from deterioration, and damage until Substantial Completion.

B. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 09 9100
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Field-applied finish paint.
   2. Surface preparation.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 09 97 13 for high performance steel coatings applied to steel surfaces installed in SSPC Environmental Zones 1B, 2A, and 2B.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. DFT: Dry Film Thickness.
   2. GU: Gloss Unit.
   3. SSPC: The Society for Protective Coatings.

B. Definitions:
   1. Manufacturer: Means the paint manufacturer, unless otherwise indicated.
   2. Paint: Means all applied materials, including fillers, primers, emulsions, enamels, varnishes, stains, lacquers, and sealers, whether used as a prime, intermediate, or finish coat.
   3. Coating: Means the same as paint.
   4. Coat: Means a layer of paint that is applied and then permitted to dry. Both back-rolling and applying wet-on-wet are one coat.
   5. Finish: Means an entire coating system, including all surface preparation methods, primers, coats, textures, colors, and sheens.
   6. Thickness: Means the total finish DFT, measured in conformance with SSPC paint application standard SSPC-PA2, "*Measurement of Dry Coating Thickness with Magnetic Gages*".
   7. Touchup: Means to correct or repair non-conforming or deficient areas to bring into conformance with the Contract Documents.
   8. Refinish: Means to apply a new finish to a previously-finished item or surface.

9. Sheen: Means the following gloss ranges, when tested in conformance with ASTM D 523.

Gloss Level 1 (Low Sheen)	Matte/Flat	1 to 5 GUs 1 to 10 GUs	60-degree meter 85-degree meter
Gloss Level 2 (Low Sheen)	Velvet	6 to 10 GUs 11 to 24 GUs	60-degree meter 85-degree meter
Gloss Level 3 (Medium Sheen)	Eggshell	11 to 20 GUs 25 to 35 GUs	60-degree meter 85-degree meter
Gloss Level 4 (Medium Sheen)	Satin	21 to 35 GUs >35 GUs	60-degree meter 85-degree meter
Gloss Level 5 (Medium Sheen)	Low sheen	36 to 49 GUs	60-degree meter
Gloss Level 6 (Medium Sheen)	Semi-gloss	50 to 70 GUs	60-degree meter
Gloss Level 7 (High Sheen)	Gloss	71 to 85 GUs Up to 60 GUs	60-degree meter 20-degree meter
Gloss Level 8 (High Sheen)	High-Gloss	>85 GUs >60 GUs	60-degree meter 20-degree meter

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Unless otherwise indicated, paint all surfaces throughout the Project, except the following.
   a. Concrete.
   b. Steel decking.
   c. Roofing.
   d. Insulation and its facing.
   e. Finish hardware, except items specified with a USP finish.
   f. Prefinished metal surfaces, including anodized aluminum, chrome plating, powder coatings, and similar pre-finished materials.
   g. Natural finish metal surfaces, including mill finish aluminum, stainless steel, copper, bronze, brass and similar finished materials.
   h. Walls or ceilings in concealed and inaccessible areas, including furred areas, chases, and shafts.
   i. Moving, mechanical, or electrical parts of operating units, including valve and damper operator linkages, sensing devices, motor and fan shafts..
   j. Nameplates and required labels, including UL, FM, and other equipment identification, performance rating, or name plates.
2. Paint all visible surfaces, including surfaces visible through registers, screens and grilles whether or not colors are designated, except where a material's natural finish is obviously intended or explicitly indicated as a surface not painted.
3. Where surfaces are not specifically indicated, paint them to match adjacent similar materials or areas.
4. Specified surface preparation, priming, and paint coats are in addition to surface preparation and shop priming indicated in other specification sections.
5. Coordinate selected paint for compatibility with primers indicated in other specification sections.
   a. Provide prime coats that are compatible with subsequent coats or provide compatible barrier coats over incompatible primers; or completely remove primer and re-prime.
   b. Verify chemical and adhesive compatibility of all coats within each paint finish.
6. Coordinate selected paint for compatibility with chemicals used near or on painted surfaces, including cleaning materials, accessories, and methods.

7. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified paint are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
8. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
    a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
    b. assume the manufacturer-recommended coverage rates govern; and
    c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.
9. Master Painters Institute standards are insufficient for and not applicable to this project.

B. Sequencing:
1. Schedule paint deliveries to the project site only after the building is enclosed with a permanent enclosure; "wet work" within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Before beginning installation, final light fixtures must be completely installed, energized, and fully illuminated to at least the same type and level of illumination, and color temperature, maintained in the room or space after the building is occupied.
3. Install paint only after penetrating items are installed.
4. After paint installation, maintain ambient conditions within a range required, recommended, approved, or accepted by the manufacturer until Final Completion.

C. Scheduling:
1. Concrete Curing: Allow enough time in the construction schedule for concrete to cure for at least 28 days and dry before beginning surface preparation and installation.
2. Concrete Masonry Units: CMU walls must be painted within 30 days after building close-in.
3. Cleaning: Schedule cleaning to prevent dust and other contaminants from falling on freshly-applied paint.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Paint Schedule:
   a. Prepare a list of specified finishes and their project locations, with selected products identified for each coat of every finish.
   b. Identify substrates to which each specified finish is applied, including surface preparation methods and primers for each substrate.
3. Samples: Submit 8-1/2-inch by 11-inch drawdown cards of each specified color and sheen. Label each card with project location.

B. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish one unopened gallon or container for each paint type, color, composition, grade, finish, and variety.
3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of painted surfaces, including a comprehensive list of known chemicals that should not come into contact with painted surfaces.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Paint must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Field Samples: Include *in-situ* mockups as part of the work of this specification section.

1. The Architect reviews field samples for conformance to the Contract Documents and approves or rejects them as the standard by which subsequent work is evaluated.
2. Revise field samples and repeat reviews, including arranging all revisions and paying all revision costs, until accepted in writing by the Architect. Final acceptance of paint is made from field samples.
3. After acceptance, promptly identify and protect field samples for reference until Substantial Completion.
4. Approved field samples may remain part of the work after being identified for future reference.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.

1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install paint only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:

1. Surface Conditions: Surfaces receiving paint must be dry. Install paint only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
2. Ventilation: Maintain adequate ventilation during and after installation and curing, setting, or drying. Where natural ventilation is inadequate, use forced-air circulation or mechanical ventilation as necessary for the installations indicated.
3. Illumination: Provide permanent lighting or illuminate work spaces to at least the same level occurring in the room or space after Final Completion.

C. Other Conditions: Do not apply paint where dust is generated, or liquids are sprayed; or when windy conditions exist that may cause paint to be blown onto vegetation or other unintended surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Dunn Edwards.
2. Benjamin Moore.
3. Sherwin Williams.

2.2 PAINT

A. Description: 100-percent premium grade (best grade) low- and no-VOC paints, unless otherwise indicated.

B. Products: Indicated in the Paint Products Schedule at the end of this specification section.

C. Requisite Properties:

1. Colors: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51.

2. Sheens: Provide the following, unless otherwise indicated.
    a. Ceilings: Not more than Gloss Level 3. (Eggshell)
    b. Trim: At least Gloss Level 6. (Gloss)
    c. Bathroom Walls: At least Gloss Level 5. (Semi-Gloss)
    d. Other Walls: At least Gloss Level 3. (Eggshell)

2.3 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 MIXING

A. Factory-mix paint to match approved samples and mockups accepted by the Architect.

B. Box paint at the project site or factory-batch to ensure uniform and consistent color. This requirement includes specified maintenance materials.

C. Open paint containers only as required for use and mix only in designated areas.

D. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

E. Do not reduce, alter, or introduce foreign materials into paint, except in conformance with manufacturer’s instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with paint adhesion, appearance, or performance.
3. Verify items penetrating paint are installed.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and paint installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent paint intrusion or migration of liquids.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install paint using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install paint under conditions that ensure finishes are free from blemishes and defects.
3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Painted surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Completed work must match approved samples and mockups, as accepted by the Architect.
6. Installed paint must be warrantable. Do not install, correct, or replace paint in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Produce uniform finished surfaces without substrates, undercoats, marks, or stains showing through. Produce sharp and even lines and color breaks.
2. Paint surfaces behind movable equipment and furniture the same as adjacent exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint back sides of access panels, removable or hinged covers, and similar hinged items the same as exposed surfaces.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.

3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed paint in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against painted surfaces unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use painted surfaces as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

3.7 SCHEDULE

A. Paint products schedule begins on the next page.

END OF SECTION

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SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
EXTERIOR SURFACES - LOW VOC				
Concrete & CMU Substrates: As specified in Section 09 96 53 - Elastomeric Coatings				
Concrete & Brick Substrates: 100% Acrylic FLAT				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	023 Fresh Start Primer
	2nd Coat	2000 Duratone	EVSH10 Evershield Flat	400 Regal Select Flat
	3rd Coat	2000 Duratone	EVSH10 Evershield Flat	400 Regal Select Flat
CMU Substrates: 100% Acrylic FLAT				
	1st Coat	018 Acrylic Block Filler	SBPR00 Blockfill	M88 Latex Block Filler
	2nd Coat	2000 Duratone	EVSH10 Evershield Flat	400 Regal Select Flat
	3rd Coat	2000 Duratone	EVSH10 Evershield Flat	400 Regal Select Flat
CMU Substrates: 100% Acrylic ELASTOMERIC				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	023 Fresh Start Primer
	2nd Coat	500 Solotex	W370 Endurawall	056 Moorlastic
	3rd Coat	500 Solotex	W370 Endurawall	056 Moorlastic
Finished Wood Surfaces: 100% Acrylic FLAT				
	1st Coat	4200 Terminator II	EZPR00 EZ Prime Premium	0046 Hi-Hide All Purpose Primer
	2nd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
	3rd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4200 Terminator II	EZPR00 EZ Prime Premium	0046 Hi-Hide All Purpose Primer
	2nd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096Regal Soft Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096Regal Soft Gloss
Finished Wood Surfaces: 100% Acrylic GLOSS				
	1st Coat	4200 Terminator II	EZPR00 EZ Prime Premium	0046 Hi-Hide All Purpose Primer
	2nd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	NA
	3rd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	NA

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Finished Wood Surfaces: Semi-Transparent Stain				
	1st Coat	Olympic Maximum ST Stain	Okon WPT-3	0638 Arborcoat S/T Stain
	2nd Coat	Olympic Maximum ST Stain	Okon WPT-3	0638 Arborcoat S/T Stain
Iron, Steel, and Galvanized Steel Surfaces: Specified in Section 09 97 13 - High Performance Steel Coatings				
Iron & Steel Substrates: 100% Acrylic GLOSS				
	1st Coat	9600 Protec	BRPR00-1 Block Rust	M04 Acrylic Metal Primer
	2nd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	N/A
	3rd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	N/A
Iron & Steel Substrates: 100% Acrylic SEMI-GLOSS				
	1st Coat	9600 Protec	BRPR00-1 Block Rust	M04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	402 Regal Soft Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	402 Regal Soft Gloss
Galvanized Steel & Aluminum Substrates: 100% Acrylic GLOSS				
	Pretreatment	Krud Kutter Metal Etch	ME01 Etch	Jasco Prep N Prime
	1st Coat	4800 Metal Pro Primer	GAPR00 Galv-Alum Premium	P04 Acrylic Metal Primer
	2nd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	N/A
	3rd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss	N/A
Galvanized Steel & Aluminum Substrates: 100% Acrylic SEMI-GLOSS				
	Pretreatment	Krud Kutter Metal Etch	ME01 Etch	Jasco Prep N Prime
	1st Coat	4800 Metal Pro Primer	GAPR00 Galv-Alum Premium	P04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096 Regal Soft Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096 Regal Soft Gloss

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Zinc Alloy Surfaces: 100% Acrylic SEMI-GLOSS				
	Pretreatment	Krud Kutter Metal Etch	ME01 Etch	Jasco Prep N Prime
	1st Coat	4800 Metal Pro Primer	GAPR00 Galv-Alum Premium	P04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096 Regal Soft Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	EVSH50 Evershield Semi Gloss	W096 Regal Soft Gloss
Fiber Cement Board Surfaces: 100% Acrylic FLAT				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	N023 Fresh Start Primer
	2nd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
	3rd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
Portland Cement Plaster (Stucco) Surfaces (Does not apply to Polymer-Modified Plaster Surfaces): Specified in Section 09 96 53 - Elastomeric Coatings				
Gypsum Soffit Board Surfaces: 100% Acrylic FLAT				
	1st Coat	4600 Uniprime II	Inter-Kote Premium IKPR00	N023 Fresh Start Primer
	2nd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
	3rd Coat	2000 Duratone	EVSH10 Evershield Flat	W105 Regal Select Flat
INTERIOR SURFACES - LOW VOC				
Concrete Surfaces: 100% Acrylic FLAT				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	N023 Fresh Start Primer
	2nd Coat	7100 Acriglo Flat	SSHL10 Spartashield Flat	547 Regal Select Flat
	3rd Coat	7100 Acriglo Flat	SSHL10 Spartashield Flat	547 Regal Select Flat
Concrete Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	7500 Acriglo Eggshell	SSHL30 Spartashield Eggshell	550 Regal Select Pearl
	3rd Coat	7500 Acriglo Eggshell	SSHL30 Spartashield Eggshell	550 Regal Select Pearl

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Concrete Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
Concrete Surfaces: 100% Acrylic GLOSS				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Concrete Surfaces: 100% Epoxy GLOSS				
	1st Coat	4600 Uniprime II	Rust Oleum Sierra S70/S71 WB	N023 Fresh Start Primer
	2nd Coat	Rust-Oleum Sierra S60 Gloss WB Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	P43 Super Spec HP Gloss Epoxy
CMU Surfaces: 100% Acrylic Flat				
	1st Coat	018 Acrylic Block Filler	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	7100 Acriglo Flat	SSHL10 Spartashield Flat	547 Regal Select Flat
	3rd Coat	7100 Acriglo Flat	SSHL10 Spartashield Flat	547 Regal Select Flat
CMU Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	018 Acrylic Block Filler	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	7500 Acriglo Eggshell	SSHL30 Spartashield Eggshell	550 Regal Select Pearl
	3rd Coat	7500 Acriglo Eggshell	SSHL30 Spartashield Eggshell	550 Regal Select Pearl
CMU Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	018 Acrylic Block Filler	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
CMU Surfaces: 100% Acrylic GLOSS				
	1st Coat	040 Block Kote	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
CMU Surfaces: 100% Epoxy GLOSS				
	1st Coat	040 Block Kote	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	Rust-Oleum Sierra S60 Gloss WB Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	P43 Super Spec HP Gloss Epoxy
Ferrous Metal Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	9600 Protec	BRPR00 Bloc-Rust	P04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
Ferrous Metal Surfaces: 100% Acrylic GLOSS				
	1st Coat	9600 Protec	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Aluminum Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	9600 Protec	BRPR00 Bloc-Rust	P04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
Aluminum Surfaces: 100% Acrylic GLOSS				
	1st Coat	9600 Protec	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	9600 Protec	BRPR00 Bloc-Rust	P04 Acrylic Metal Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SSHL50 Spartashield Semi-Gloss	551 Regal Select Semi Gloss
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic GLOSS				
	1st Coat	9600 Protec	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Rough Sawn Wood Surfaces: Semi-Transparent Stain				
	1st Coat	Olympic S/T Stain	Okon WPT-3	0638 Arborcoat S/T Stain
	2nd Coat	Olympic S/T Stain	Okon WPT-3	0638 Arborcoat S/T Stain
Finished Wood Surfaces: Semi-Transparent Stain				
	1st Coat	VWS0250 Series ST Stain	Old Masters Wood Stain	Moore's S/T WB Stain
Finished Wood Surfaces: Clear Lacquer Finish				
	1st Coat	NRS 1620 Sanding Sealer	LQX 101-0 Sanding Sealer	NRS 1620 Sanding Sealer
	2nd Coat	NRF 1626 Satin Lacquer	LQX 104-0 Satin Lacquer	NRF 1626 Satin Lacquer
	3rd Coat	NRF 1626 Satin Lacquer	LQX 103-0 Satin Lacquer	NRF 1626 Satin Lacquer
Finished Wood Surfaces: Water White Finish (for light-colored stains)				
	1st Coat	NAF 1420 Satin Sealer	LQX 131-0 Sanding Sealer	NAF 1420 Satin Sealer
	2nd Coat	NAF 1422 Satin Lacquer	LQX 132-0 Satin Lacquer	NAF 1426 Satin Lacquer
	3rd Coat	NAF 1422 Satin Lacquer	LQX 132-0 Satin Lacquer	NAF 1426 Satin Lacquer
Finished Wood Surfaces: Clear Varnish Finish FLAT				
	1st Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
	2nd Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
	3rd Coat	Zenith PKF7501 Flat	Zenith PKF7501 Flat	Zenith PKF7501 Flat
Finished Wood Surfaces: Clear Varnish Finish SEMI-GLOSS				
	1st Coat	Zenith PKF7501 Flat	Zenith PKF7502 Satin	Zenith PKF7502 Satin
	2nd Coat	Zenith PKF7501 Flat	Zenith PKF7502 Satin	Zenith PKF7502 Satin
	3rd Coat	Zenith PKF7501 Flat	Zenith PKF7502 Satin	Zenith PKF7502 Satin
Finished Wood Surfaces: Clear Varnish Finish GLOSS				
	1st Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss
	2nd Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss
	3rd Coat	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss	Zenith PKC7509 Gloss
Finished Wood Surfaces: 100% Acrylic LOW SHEEN				
	1st Coat	4200 Terminator II	UGPR00 Ultra-Grip	0046 Hi-Hide All Purpose Primer
	2nd Coat	1750 Acriglo Low Sheen	SPMA20 Suprema VS	549 Regal Select Eggshell
	3rd Coat	1750 Acriglo Low Sheen	SPMA20 Suprema VS	549 Regal Select Eggshell

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4200 Terminator II	UGPR00 Ultra-Grip	0046 Hi-Hide All Purpose Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
Finished Wood Surfaces: 100% Acrylic Dryfall FLAT				
	1st Coat	DF 12 Dryfall Flat	W 6079 Aquafall Flat	M53 Dryfall Flat
	2nd Coat	DF 12 Dryfall Flat	W 6079 Aquafall Flat	M53 Dryfall Flat
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic FLAT				
	1st Coat	4000 Uniprime II	UGPR00 Ultra-Grip	N023 Fresh Start Primer
	2nd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
	3rd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4000 Uniprime II	UGPR00 Ultra-Grip	N023 Fresh Start Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic GLOSS				
	1st Coat	4000 Uniprime II	UGPR00 Ultra-Grip	N023 Fresh Start Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Portland Cement Plaster Surfaces: 100% Acrylic FLAT				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
	3rd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
Portland Cement Plaster Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	7500 Acriglo Eggshell	SPMA30 Suprema LS	550 Regal Select Pearl
	3rd Coat	7500 Acriglo Eggshell	SPMA30 Suprema LS	550 Regal Select Pearl

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Portland Cement Plaster Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
	3rd Coat	7000 Acriglo Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
Portland Cement Plaster Surfaces: 100% Acrylic GLOSS				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop Premium	N023 Fresh Start Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Portland Cement Plaster Surfaces: 100% Epoxy GLOSS				
	1st Coat	4600 Uniprime II	Rust-Oleum S70/S71 WB	N023 Fresh Start Primer
	2nd Coat	Rust-Oleum Sierra S60 Gloss WB Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	P43 Super Spec HP Gloss Epoxy
Gypsum Board Surfaces: 100% Acrylic FLAT				
	1st Coat	N/A	VNPR00 Vinylastic Premium	NA
	2nd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
	3rd Coat	7100 Acriglo Flat	SPMA10 Suprema Flat	547 Regal Select Flat
Gypsum Board Surfaces: 100% Acrylic LOW SHEEN				
	1st Coat	5001 Vpro Primer	VNPR00 Vinylastic Premium	N023 Fresh Start Primer
	2nd Coat	5200 Vpro Low Sheen	SPMA20 Suprema VS	549 Regal Select Eggshell
	3rd Coat	5200 Vpro Low Sheen	SPMA20 Suprema VS	549 Regal Select Eggshell
Gypsum Board Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	5001 Vpro Primer	VNPR00 Vinylastic Premium	N023 Fresh Start Primer
	2nd Coat	5300 Vpro Eggshell	SPMA30 Suprema LS	550 Regal Select Pearl
	3rd Coat	5300 Vpro Eggshell	SPMA30 Suprema LS	550 Regal Select Pearl

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Gypsum Board Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	VNPR00 Vinylastic Premium	N023 Fresh Start Primer
	2nd Coat	5400 Vpro Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	SPMA50 Suprema Semi Gloss	551 Regal Select Semi Gloss
Gypsum Board Surfaces: 100% Acrylic GLOSS				
	1st Coat	5001 Vpro Primer	VNPR00 Vinylastic Premium	N023 Fresh Start Primer
	2nd Coat	8500 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
	3rd Coat	8501 Carefree Gloss	EVSH 60 Evershield Gloss	794 Advance High Gloss
Gypsum Board Surfaces: 100% Epoxy GLOSS				
	1st Coat	5001 Vpro Primer	Rust-Oleum Sierra S70/S71 WB Epoxy Acrylic Primer	N/A
	2nd Coat	Rust-Oleum Sierra S60 Gloss WB Epoxy	Rust-Oleum Sierra S60 Gloss WB Epoxy	N/A
Acoustical Tile Surfaces: 100% Acrylic FLAT				
	1st Coat	013 Acoustic Kote	W 615 Acoustikote	258 Moore's Ceiling White
	2nd Coat	013 Acoustic Kote	W 615 Acoustikote	258 Moore's Ceiling White
INTERIOR SURFACES - ZERO VOC				
Concrete Surfaces: Acrylic FLAT				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	3rd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
Concrete Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
	3rd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Concrete Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
CMU Surfaces: Acrylic FLAT				
	1st Coat	040 Block Kote	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	3rd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
CMU Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	040 Block Kote	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
	3rd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
CMU Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	040 Block Kote	SBPR00 Blockfill	160 Latex Block Filler
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Iron & Steel Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	9600 Protec	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Aluminum Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4800 Metal Pro Primer	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Stainless Steel, Copper, and Brass Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	4800 Metal Pro Primer	UGPR00 Ultra-Grip	P04 Acrylic Metal Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Finished Wood Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	5001 Vpro Primer	UGPR00 Ultra-Grip	511 Natura Primer
	2nd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
	3rd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
Finished Wood Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	UGPR00 Ultra-Grip	511 Natura Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Particle Board, MDF, and Hardboard Surfaces: Acrylic FLAT				
	1st Coat	5001 Vpro Primer	UGPR00 Ultra-Grip	511 Natura Primer
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	3rd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
Particle Board, MDF, and Hardboard Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	UGPR00 Ultra-Grip	511 Natura Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Portland Cement Plaster Surfaces: Acrylic FLAT				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	3rd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
Portland Cement Plaster Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
	3rd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
Portland Cement Plaster Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Gypsum Board Surfaces: Acrylic FLAT				
	1st Coat	Not Required	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	3rd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
Gypsum Board Surfaces: 100% Acrylic EGGSHELL				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell
	3rd Coat	5300 Vpro Eggshell	EVER 30 Everest Eggshell	513 Natura Eggshell

SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
Gypsum Board Surfaces: 100% Acrylic SEMI-GLOSS				
	1st Coat	5001 Vpro Primer	VNSL00 Vinylastic Select Primer	511 Natura Primer
	2nd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
	3rd Coat	5400 Vpro Semi-Gloss	EVER 50 Everest Semi Gloss	514 Natura Semi Gloss
Acoustical Tile Surfaces: Acrylic FLAT				
	1st Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat
	2nd Coat	5100 Vpro Flat	EVER 10 Everest Flat	512 Natura Flat

SECTION 09 9713
HIGH-PERFORMANCE STEEL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-applied high-performance steel coatings applied to exterior exposed-in-service ferrous metal (iron and steel) surfaces (SSPC Environmental Zones 1B, 2A, and 2B).
2. Surface preparation.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:

1. Section 09 91 00 for painting steel surfaces installed in SSPC Environmental Zones 0 and 1A, including field-applied primers and spot primers.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the high-performance coating manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selected coating for compatibility with chemicals used near or on coated surfaces, including cleaning materials, accessories, and methods.
2. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified high-performance coatings are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
3. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
   a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;

b. assume the manufacturer-recommended coverage rates govern; and
c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

4. Master Painters Institute standards are insufficient for and not applicable to this project.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Samples: Submit 8-1/2-inch by 11-inch drawdown cards of each specified color and sheen. Label each card with project location.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished high-performance coatings.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

D. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish one unopened gallon or container for each high-performance coating type, color, composition, grade, finish, and variety.
3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of coated surfaces, including a comprehensive list of known chemicals that should not come into contact with coated surfaces.

1.5 QUALITY ASSURANCE

A. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing high-performance coatings for previous projects similar to this project in size, material, design, and complexity. Only a company certified by the SSPC as having a current QP1 certification may apply high-performance coatings.
2. Supervisors: Individuals must have experience installing high-performance coatings for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading high-performance coating installers.

B. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate high-performance coatings into the mockup as part of the work of this specification section.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
1. Avoid damage to packaging and containers, and contamination of contents.
2. Rotate inventory; do not use items the shelf life of which is expired.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective high-performance coatings with undamaged new high-performance coatings that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install high-performance coatings only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.

B. Existing Conditions:
1. Surface Conditions: Surfaces receiving high-performance coatings must be dry. Install high-performance coatings only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
2. Other Conditions: Do not apply high-performance coatings where dust is generated, or liquids are sprayed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Carboline Co.
   2. PPG Industries, Inc.
   3. Tnemec Co.

2.2 HIGH PERFORMANCE COATING

A. Spot Primer for Unprimed and Zinc-Rich-Primed Surfaces:
   1. Description: Zinc-rich organic primer conforming to SSPC-Paint 20 Type II (Organic) zinc-rich primers and AISC requirements for Class B surface slip coefficient rating (minimum mean slip coefficient of at least 0.50).
   2. Product: “94-H20 Hydro-Zinc” manufactured by the Tnemec Co., or equal.
   3. Requisite Properties:
      a. Minimum Thickness: Apply to a DFT of between 2.5 and 3.5 mils, when measured in conformance with SSPC paint application standard SSPC-PA2, “*Measurement of Dry Coating Thickness with Magnetic Gages*”.
      b. Colors: Reddish-gray or other standard color furnished by the primer manufacturer.
   4. Performance Requirements:
      a. Zinc Dust Pigment: ASTM D 520 Type III composition classification (maximum 0.002 percent lead).
      b. Dry Film Adhesion: At least 800 pounds per square inch pull, when tested in conformance with ASTM D 4541.
      c. Humidity Resistance: No blistering, cracking, rusting, or film delamination after at least 1,000 hours exposure, when tested in conformance with ASTM D 4585.
      d. Salt Spray Resistance: No blistering, cracking, rusting, or film delamination; nor more than 1/32-inch rust creep at scribe after at least 10,000 hours exposure, when tested in conformance with ASTM B 117.

B. Spot Primer for Other Shop-Primed Surfaces: Provide spot primer identical to the shop primer originally used to prime metal surfaces.

C. Epoxy Intermediate Coat:
   1. Product: “Hi-Build Epoxoline II Series L69” manufactured by the Tnemec Co., or equal.
   2. Requisite Properties:
      a. Material: 2-component polyamidoamine epoxy.
      b. Minimum Thickness: Apply to a DFT of between 6.0 and 10.0 mils per coat, when measured in conformance with SSPC paint application standard SSPC-PA2, “*Measurement of Dry Coating Thickness with Magnetic Gages*”.
      c. Color: Match Tnemec color 10BL, “Cornflower”.
      d. Specular Gloss (Sheen): Satin.
   3. Performance Requirements:
      a. Dry Film Adhesion: Minimum rating of 5, when tested in conformance with ASTM D 3359.
      b. Humidity Resistance: No blistering, cracking, rusting or delaminating of film after minimum 1,000 hours exposure, when tested in conformance with ASTM D 4585.
      c. Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film; and not more than 3/16-inch rust creep at scribe after 10,000 hours exposure, when tested in conformance with ASTM B 117.
D. Aliphatic Polyurethane Topcoat:
   1. Product: “1095 Endura-Shield” manufactured by the Tnemec Co., or equal.
   2. Requisite Properties:
      a. Material: Aliphatic acrylic polyurethane.
      b. Minimum Thickness: Apply to a DFT of between 3.0 and 6.0 mils per coat, when measured in conformance with SSPC paint application standard SSPC-PA2, “*Measurement of Dry Coating Thickness with Magnetic Gages*”.
      c. Color: Black.
      d. Specular Gloss (Sheen): Semi-gloss.
   3. Performance Requirements:
      a. Dry Film Adhesion: At least 1,260 pounds per square inch pull, when tested in conformance with ASTM D 441, (Method E, Type V Tester) , average of 3 tests.
      b. Humidity Resistance: No blistering, cracking, rusting, or delaminating of film after minimum 5,000 hours exposure, when tested in conformance with ASTM D 4585.

c. UV Resistance: No blistering, cracking, or delamination, and not less than 58 percent gloss retention or 15.2 units gloss change and 1.40 DECIE2000 color change (white) after 4,000 hours exposure.

d. Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film; or rust creep after 5,000 hours exposure, when tested in conformance with ASTM B 117.

2.3 SURFACE PREPARATION

A. Unprimed Iron and Steel Surfaces:

1. Normally-Dry Interior Exposed-In-Service Conditions: Prepare surfaces in conformance with the primer manufacturer's application instructions and SSPC-SP-3, "*Power Tool Cleaning*".

2. Elsewhere: Prepare surfaces in conformance with primer manufacturer's application instructions and SSPC-SP-11, "*Power Tool Cleaning to Bare Metal*".

B. Shop-Primed Iron and Steel Surfaces:

1. Clean damaged primer areas and prepare damaged primer and adjacent surfaces in conformance with the steel coating manufacturer's application instructions and SSPC-SP-11, "*Power Tool Cleaning to Bare Metal*".

2. Sand smooth and re-clean.

3. Spot-prime bare metal surfaces with specified spot-primer applied to a minimum total spot primer DFT of between 2.5 and 3.5 mils.

4. Overlap undamaged primer areas with spot primer a minimum of at least 2 inches.

C. Unknown or Incompatible Primer: Apply full prime coat of specified spot primer on all surfaces as a tie-coat for subsequent intermediate and top coats.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Open high-performance coating containers only as required for use and mix only in designated areas.

B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

C. Do not reduce, alter, or introduce foreign materials into high-performance coatings, except in conformance with manufacturer's instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with high-performance coating adhesion, appearance, or performance.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and high-performance coating installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent high-performance coating intrusion or migration of liquids.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install high-performance coatings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install high-performance coatings under conditions that ensure finishes are free from blemishes and defects.

3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. high-performance coating surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Completed work must match approved samples and mockups, as accepted by the Architect.
6. Installed high-performance coatings must be warrantable. Do not install, correct, or replace high-performance coatings in a manner that results in any warranty or guarantee becoming void.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.

3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect high-performance coatings in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against high-performance coatings unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed high-performance coatings as work surfaces.

END OF SECTION

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SECTION 09 9723
PENETRATING CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrating concrete floor sealer.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the concrete sealer manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify chemical and adhesive compatibility of selected concrete sealer with installed curing compounds and installed moisture vapor emission control systems, based on current product formulations.
2. Coordinate selected sealer for compatibility with chemicals used near or on coated surfaces, including cleaning materials, accessories, and methods.
3. Proposed substitution requests and submittals that change the quality (grade) or generic chemistry of specified concrete sealers are prohibited and returned to the Contractor without review or responsive action, except to record non-conformance with this requirement.
4. Specified coverage rates and thicknesses are minimum. If manufacturer's recommended coverage rates differ from specified rates, then
   a. consult the manufacturer's representative and obtain manufacturer-recommended coverage rates printed on manufacturer's letterhead;
   b. assume the manufacturer-recommended coverage rates govern; and
   c. promptly submit an RFI to the Architect for resolution; include manufacturer-recommended coverage rates with the RFI.

B. Sequencing:

1. Install concrete sealers only after concrete is cured to a condition of equilibrium; is sufficiently dry to bond with concrete sealers; and has alkalinity (pH), MVER, and RH within ranges required, recommended, or accepted by the manufacturer.
2. Either delay concrete sealer installation until after joint sealant installation is complete, or protect sealant bond surfaces to prevent concrete sealer migration onto joint surfaces. concrete sealer application may only precede sealant application after sealant adhesion and compatibility are tested and verified using substrates, concrete sealers, and sealant materials identical to those used in the work.

C. Scheduling: Allow enough time in the construction schedule for concrete to cure for at least 28 days before beginning surface preparation and installation.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished concrete sealers.
   a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.
2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

C. Maintenance Material Submittals:

1. Before Final Completion, deliver to the Owner extra stock materials to replace those worn or damaged as a result of normal occupancy.
2. Furnish one unopened gallon or container for each concrete sealer type, color, composition, grade, finish, and variety.

3. Submit manufacturer-recommended cleaning materials, accessories, and manufacturer's instructions and other requirements and recommendations for maintenance and cleaning of sealed surfaces, including a comprehensive list of known chemicals that should not come into contact with sealed surfaces.

1.5 QUALITY ASSURANCE

A. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Installer: Company or individuals must have experience installing concrete sealers for previous projects similar to this project in size, material, design, and complexity.
2. Supervisors: Individuals must have experience installing concrete sealers for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading concrete sealer installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage.
   1. Avoid damage to packaging and containers, and contamination of contents.
   2. Rotate inventory; do not use items the shelf life of which is expired.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective concrete sealers with undamaged new concrete sealers that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 PROJECT CONDITIONS

A. Ambient Conditions: Install concrete sealers only when ambient temperature, RH, and other environmental conditions fall within ranges required, recommended, or accepted by the manufacturer.
   1. Do not install concrete sealers during rain or snow, fog or mist; or when rain or snow is predicted within 24 hours of installation.
   2. Proceed only when there is no threat of impending precipitation, and both current and forecasted weather conditions conform to those required, recommended, or accepted by the manufacturer.
   3. Do not apply concrete sealers when
      a. ambient temperature is below 45 deg. F or more than 90 deg. F during application, and for at least 8 hours after;
      b. surface temperatures are less than 40 deg. F or greater than 120 deg. F; and
      c. surface temperatures are 5 deg. F or less above the dew point.
B. Existing Conditions:
   1. Surface Conditions: Surfaces receiving concrete sealers must be dry. Install concrete sealers only when substrate moisture content and surface temperature fall within ranges required, recommended, or accepted by the manufacturer.
   2. Other Conditions: Do not apply concrete sealers where dust is generated, or liquids are sprayed; or when windy conditions exist that may cause concrete sealers to be blown onto vegetation or other unintended surfaces.

PART 2 - PRODUCTS

2.1 PENETRATING CONCRETE FLOOR SEALER

A. Description: Clear-drying, water-based silane or siloxane water repellent sealer for interior exposed concrete slabs.

B. Product: “Sure Klean Weather Seal Siloxane WB Concentrate” manufactured by PROSOCO, Inc., or equal.

1. Porous Surfaces (e.g., Concrete Brick, Concrete Pavers, and Concrete Tile): Dilute to 1 part concentrate to not more than 7 parts water.
2. Semi-Porous Surfaces (e.g., Cast-in-Place Concrete, Precast Concrete, Clay Brick, Terra Cotta, and Unpolished Sandstone): Dilute to 1 part concentrate to not more than 9 parts water.
3. Dense Surfaces: Dilute to 1 part concentrate to not more than 14 parts water.

C. Requisite Properties: When compared visually to an untreated sample under the same lighting conditions, concrete sealers may not alter the color or sheen of the coated substrate and must be invisible after application and over the life of the substrate. Confirm visual appearance by mockups and adjust products and applications as required.

2.2 ACCESSORIES

A. Mix Water: Provide fresh, clean, clear, potable water from a domestic source. Water must conform to ASTM C 1602 and be free of oil, grease, waxy films, curing compounds, release agents, and other deleterious materials, including salts, acids, alkalis, organic materials, detergents, and other matter that might negatively affect tile quality, durability, or performance.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 MIXING

A. Open concrete sealer containers only as required for use and mix only in designated areas.

B. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

C. Do not reduce, alter, or introduce foreign materials into concrete sealers, except in conformance with manufacturer’s instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification:

1. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
2. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with concrete sealer adhesion, appearance, or performance.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Protection:

1. Work Area Protection: Protect work areas from dust and other airborne contaminants during surface preparation and concrete sealer installation.
2. Adjacent Material Protection: Protect adjacent surfaces against soiling and damage. Utilize drop cloths, shields, masking, barricades, and other items necessary to protect adjacent surfaces.
3. Opening Protection: Close and protect drains and other openings and penetrations to prevent concrete sealer intrusion or migration of liquids.

B. Substrate Preparation: Prepare substrates as required, recommended, or accepted by the manufacturer without limitation; and in a manner that does not result in any warranty or guarantee becoming void.

3.3 INSTALLATION

A. General Requirements:

1. Install concrete sealers using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install concrete sealers under conditions that ensure finishes are free from blemishes and defects.

3. Provide smooth surfaces of uniform finish, color, appearance, and coverage. concrete sealer surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
4. Do not exceed the application rates recommended by the manufacturer.
5. Installed concrete sealers must be warrantable. Do not install, correct, or replace concrete sealers in a manner that results in any warranty or guarantee becoming void.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean spills, stains, soiling, overspray, and fallout from adjacent surfaces.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.

4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect sealed concrete in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against sealed concrete unless it is protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed sealed concrete surfaces as work surfaces.

END OF SECTION

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DIVISION 10

SPECIALTIES

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Signs must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
   1. Chemical Signs and Labels: Provide Proposition 65 signage in conformance with California Code of Regulations (CCR), Title 27.
   2. Raised Characters: Raised characters must conform to the requirements of California Building Code Section 11B-703.2:
   3. Depth: It must be 1/32-inch (0.8 mm) minimum above their background and must be sans serif uppercase and be duplicated in Braille.
   4. Height: It must be 5/8-inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". California Building Code Section 11B-703.2.5
   5. Finish and Contrast: Characters and their background must have a non-glare finish. Character must contrast with their background with either light characters on a dark background or dark characters on a light background. California Building Code Section 11B-703.5.1
   6. Proportions: It must be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" must be 15 percent maximum of the height of the character. California Building Code Sections 11B-703.2.4 and 11B-703.2.6

7. Character Spacing: Spacing between individual raised characters must conform to the requirements of California Building Code Section 11B-703.2.7 and 11B-703.2.8
8. Format: Text must be in a horizontal format. California Building Code Section 11B-703.2.9
9. Braille: It must be contracted (Grade 2) and must conform to the requirements of California Building Code Sections 11B-703.3 and 11B-703.4. Braille dots must have a domed or rounded shape and must conform to the requirements of California Building Code Table and Figure 11B-703.3.1.
10. Mounting Height: Tactile characters on signs must be located 48 inches minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. California Building Code Section and Figure 11B-703.4.1
11. Mounting Location: A tactile sign must be located per California Building Code Section and Figure 11B -703.4.2 as follows:
    a. alongside a single door at the latch side.
    b. on the inactive leaf at double doors with one active leaf.
    c. to the right of the right hand door at double doors with two active leaves.
    d. on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
    e. so that a clear floor space of 18 inches by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
12. Visual characters must conform to the requirements of California Building Code Section 11B-703.5 and must be 40 inches minimum above finish floor or ground.
13. Pictograms must conform to the requirements of California Building Code Section 11B-703.6.
14. Symbols of accessibility must conform to the requirements of California Building Code Section 11B-703.7.
15. Variable message signs must conform to the requirements of California Building Code Section 11B-703.8.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective signs with undamaged new signs that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 PHOTOPOLYMER PANEL SIGNS

A. Description: Single-piece photopolymer panel permanent identification signs consisting of moisture resistant non-glare photopolymer bonded to sign base material.

B. Manufacturer: Provide photopolymer products manufactured by Nova Polymers, Inc., or equal.

C. Fabricators: Provide signs fabricated by one of the following, or equal.

   1. Neiman & Co.
   2. Signtech Inc.

D. Materials:
   1. Photopolymer Layer: 0.040-inch acrylic photopolymer.
   2. Base Material:
      a. Interior Locations: 0.120-inch phenolic base.
      b. Exterior Locations: Exterior grade photopolymer applied to a 0.120-inch phenolic base.
E. Requisite Properties:
   1. Overall Panel Thickness: Between 1/8- and 1/4-inch.
   2. Colors: ProductOptions indicated on the Drawings or selected by the Architect.
   3. Finish: Furnish non-glare finish.
   4. Edge Condition: Square cut.
   5. Corner Condition: Square.
   6. Mounting: Indicated on the Drawings.
   7. Copy: ProductOptions indicated on the Drawings or selected by the Architect.
      a. Letter spacing must conform to standards shown and kerned optically to the acceptance of the Architect.
      b. Lines of copy must be straight and parallel to the sign format, unless otherwise indicated.
      c. Edges of letters, numbers, and symbols must be smooth and continuous, with straight and curved portions reproducing the original forms exactly, with corners sharp and true.
      d. All forms must be free from ticks, line waiver, discontinuous curves, and other imperfections.
   8. Font: ProductOptions indicated on the Drawings or selected by the Architect.

2.2 INSTALLATION MATERIALS

A. Fasteners: Non-removable mechanical fasteners and anchors suitable for secure attachment to substrate and placed through predrilled holes as recommended in writing by the sign manufacturer.
   1. Exposed Fasteners: Exposed fasteners are permitted only where specifically stated in the drawings and must be stainless steel painted or finished to match adjacent surfaces, unless otherwise indicated.
   2. Concealed Fasteners: Fabricate from metals that are not corrosive to the sign material and mounting surface.
B. Tape: “VHB Tape” manufactured by 3M, or equal.
C. Adhesive: “732 Multi-Purpose Sealant Clear” manufactured by Dow Corning Corp., or equal.

2.3 ACCESSORIES

A. Plastic Cement: “WELD-ON 4” manufactured by IPC Corp., or equal.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install signs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed signs must be warrantable. Do not install, correct, or replace signs in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach signs to supporting construction.

C. Installation Tolerances: Install signs to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible sign surfaces in a manner that does not result in any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed signs in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed signs unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed signs as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 2113
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid plastic toilet compartments.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the toilet compartment manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing toilet compartment layout, materials, construction, and finishes. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.
3. Samples: Submit at least 8-inch square representative samples of each toilet compartment color, finish, and variety.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished toilet compartments.

2. If manufacturer’s instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer’s representative and obtain project-specific supplemental instructions printed on manufacturer’s letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit copies of manufacturer’s instructions and other requirements and recommendations for toilet compartment maintenance, cleaning, and repair to the Architect as a condition of project closeout.

1.4 QUALITY ASSURANCE

A. Source Limitations:
1. Toilet compartments must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
1. Wheelchair accessible compartments must conform to the requirements of California Building Code Section 11B-604.8.1.
2. Toe clearance for at least one side partition of a wheelchair accessible compartment must conform to the requirements of California Building Code Section and Figure 11B-604.8.1.4. It must be 9 inches high minimum above the finish floor and 6 inches deep minimum beyond the compartment side face of the partition, exclusive of partition support members. It must be 12 inches high minimum above the finish floor for children's use. Partition components at toe clearances must be smooth without sharp edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66 inches wide.

3. Ambulatory accessible compartments must be provided where there are six or more toilet compartments, or where the combination of urinals and water closets totals six or more fixtures. Such compartments must be provided in the same quantity as wheelchair accessible compartments per California Building Code Section 11B-213.3.1 and must conform to the requirements of California Building Code Section 11B-604.8.2.
4. Door and door hardware for accessible compartments must be self-closing and must conform to the requirements of California Building Code Section 11B-404 except that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction must be 44 inches minimum. California Building Code Figure 11B-604.8.2.
5. A door pull complying with California Building Code Section 11B-404.2.7 must be placed on both sides of the accessible compartment door near the latch.
6. Toilet compartment doors must not swing into the clear floor space or clearance required for any fixture or into the minimum compartment area required for ambulatory accessible compartments.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer’s instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective toilet compartments with undamaged new toilet compartments that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 SOLID PLASTIC TOILET COMPARTMENTS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 HARDWARE

A. General:

1. Provide stainless steel 18-8, Type 304 No. 4 finish hardware. Chrome-plated brass, chrome-plated zinc alloy and aluminum hardware are prohibited.
2. Provide manufacturer’s standard vandal-resistant option for all hardware.

B. Hinges: Provide stainless steel wraparound gravity hinges, through-bolted to pilasters, and that allow for fully-adjustable door closing position.

C. Latches: Provide stainless steel surface-mounted slide latch and keeper.

D. Door Pull: Provide stainless steel pulls at out-swinging doors mounted in conformance with the accessibility requirements of the authorities having jurisdiction. Provide pulls at both sides of compartment doors indicated to be accessible.

E. Coat Hook/Bumper: Provide manufacturer's standard combination hook and rubber-tipped bumper, mounted on the water closet side of each compartment door, and sized to prevent door from hitting compartment-mounted accessories.

2.3 ACCESSORIES

A. Heat-Sink Strips: Provide aluminum heat-sink strips fastened to exposed bottom edges of doors and panels with vandal-proof fasteners.

B. Brackets: Provide stainless steel continuous brackets.

C. Pilaster Shoes: Provide 3-inch high stainless steel shoes secured by concealed fasteners.

D. Mounting Brackets: Stainless steel, mounted inside compartment. Mounting brackets exposed on the exterior of the compartment are prohibited. Wall mounted urinal screen brackets must be at least 0.1250-inch thick (USSG 11) double thickness.

E. Fasteners: Provide tamper-resistant stainless steel fasteners for component connections, for attaching exposed hardware and for fastening compartments to walls.

F. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

G. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install toilet compartments using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed toilet compartments must be warrantable. Do not install, correct, or replace toilet compartments in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
   1. Set pilasters with anchorages having at least 2-inch penetration into structural floor, unless otherwise recommended by partition manufacturer.
      a. Level, plumb, and tighten installation with devices furnished.
      b. Hang doors and adjust so that tops of doors are level with tops of pilasters when doors are in closed position.
   2. Install hardware as recommended by manufacturer. Conceal evidence of drilling in finished work.
C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach toilet compartments to supporting construction.
D. Installation Tolerances: Install toilet compartments to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet toilet compartment door and hardware operation.
B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.
C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.
B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible toilet compartment surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed toilet compartments in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed toilet compartments unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed toilet compartments as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 2600
WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Corner guards.
   2. Protective wall covering.
   3. Protective handrails.
   4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the wall protection manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
   3. Samples:
      a. Submit at least 8-inch square representative samples of each protective wall covering color, finish, and variety.
      b. Submit at least 6-inch long representative samples of each corner guard type, color, finish, and variety.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Submit manufacturer-prepared published instructions for proper installation of furnished wall protection.

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Wall protection must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
B. Regulatory Requirements:
   1. Surface-Burning Characteristics: Provide wall protection having a maximum FSI Value of 25 or less and a maximum SDI Value of less than 450 (Class A), when tested in conformance with ASTM E 84.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective items with undamaged new items that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 PROTECTIVE WALL COVERING

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.3 PROTECTIVE HANDRAILS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.4 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Mounting and Material Adhesives: Structural-grade silicone or epoxy adhesives of type recommended or accepted by manufacturer for conditions of use.

C. Sealant:

1. Description: Clear or white, medium or high modulus, mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.

2. Products: “786” manufactured by Dow Corning Corp., or “Sanitary SCS 1700” manufactured by Momentive Performance Materials, Inc., or equal.

D. Solvent: Supplied, required, recommended, or accepted by the manufacturer to clean substrates to ensure adhesion of adhesives and sealants.

E. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on installed wall protection and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering wall protection surfaces.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install wall protection using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed wall protection must be warrantable. Do not install, correct, or replace wall protection in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach wall protection to supporting construction.

C. Installation Tolerances: Install wall protection to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible wall protection surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed wall protection in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed wall protection unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed wall protection as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 2813
COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial toilet accessories.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the toilet accessory manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished toilet accessories.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Toilet accessories must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Elements of sanitary facilities must be mounted at locations in conformance with California Building Code Sections 11B-602 through 11B-612.
2. Grab bars in toilet facilities and bathing facilities must conform to the requirements of California Building Code Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars must be free of sharp or abrasive elements and must have rounded edges. The space around the grab bars must be as follows:
   a. 1-1/2-inch between the grab bar and the wall.
   b. 1-1/2-inch minimum between the grab bar and projecting objects below and at the ends.
   c. 12 inches minimum between the grab bar and projecting objects above.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective toilet accessories with undamaged new toilet accessories that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 COMMERCIAL TOILET ACCESSORIES

A. Products: Indicated on the Drawings in the Toilet Accessory Schedule, Sheet A5.04, or equal.

B. Materials:

1. Stainless-Steel Sheet: ASTM A 666 (annealed and tempered) Type 304 tension leveled to a flatness of 5 I-units or less.
2. Mirrored Glass: ASTM C 1503, Q-1 Mirror Select Quality.

2.2 ACCESSORIES

A. Pipe Guards:

1. Description: Insulating antimicrobial, molded plastic, white pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Manufacturers: Provide products manufactured by one of the following, or equal.
   a. Plumberex Specialty Products, Inc.
   b. IPS Corp.

B. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

C. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install toilet accessories using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed toilet accessories must be warrantable. Do not install, correct, or replace toilet accessories in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach toilet accessories to supporting construction.

C. Installation Tolerances: Install toilet accessories to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible toilet accessory surfaces in a manner that does not result in any warranty or guarantee becoming void.
   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.
B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed toilet accessories in place from soiling, deterioration, and damage until Substantial Completion.
B. Do not store anything on or adjacent to or against installed toilet accessories unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed toilet accessories as work surfaces.
C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire extinguishers.
2. Fire extinguisher cabinets.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the fire protection specialty manufacturer, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate size of fire extinguisher cabinets to ensure specified fire extinguishers and capacities are accommodated.
2. Coordinate sizes and locations of fire extinguisher cabinets with wall depths.
3. Final location of fire extinguisher cabinets is subject to fire marshal approval.
   a. Verify cabinet locations with both the fire marshal and the Architect during the framing stage of the project.
   b. Positioning of cabinets at locations other than where indicated are at no additional cost to the Owner.
4. Where extinguishers are not indicated, assume cabinets and extinguishers are located within 75 feet of any point in the building, or at a rate of one for each 3,000 square feet of building area, or portion thereof, whichever yields the greater number of fire extinguishers.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings:
   a. Submit dimensioned plans and elevations drawn to scale and showing fire extinguisher cabinet locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project. Cross-reference details to plans and elevations.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished fire protection specialties.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Fire protection specialties must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:
   1. Mounting Height: When installed within the cabinet, bracket-mounted extinguisher handles height must conform to the prescribed limits for an ADA-accessible front-approach reach.
   2. UL Listing:
      a. Provide UL-listed fire extinguishers bearing the UL listing mark for type, fire classification, and rating specified.
      b. Provide cabinets with the same fire rating as wall in which they are installed.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective fire protection specialties with undamaged new fire protection specialties that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Activar Construction Products Group, Inc.
   2. Larsen's Manufacturing Co.
   3. Potter Roemer Fire Protection Equipment.

2.2 FIRE EXTINGUISHERS

A. Description: UL-listed, heavy duty, enameled steel cylinder, multi-purpose dry chemical fire extinguishers conforming to NFPA 10 requirements for portable extinguishers, and bearing the UL listing mark for type, fire classification, and rating specified.

B. Products: "JL Industries Cosmic 10E" manufactured by Activar Construction Products Group, Inc., or equal.

C. Requisite Properties:
   1. Capacity: 10 pounds.
   2. UL Rating: 4-A:80-B:C.
   3. Cylinder Diameter: Not more than 5-1/4 inches.
   4. Overall Height: Not more than 22 inches.

2.3 FIRE EXTINGUISHER CABINETS

A. Description: Fire extinguisher cabinets conforming to ASTM E 814 when installed within fire-resistance rated wall assemblies. Cabinets must have the same fire-resistance rating as the wall in which they are installed.

B. Stainless Steel Cabinets:
   1. Products: "JL Industries Cosmopolitan Series" manufactured by Activar Construction Products Group, Inc., or equal.
      a. Flat Trim Recessed Cabinets: "Model No. 1035V17" (non-locking) or "Model No. 1035W17" (locking).
      b. Square Trim Semi-Recessed Cabinets: "Model No. 1036V17" (non-locking) or "Model No. 8136W17" (locking).
      c. Surface-Mounted Square Cabinets: "Model No. 1033V17" (non-locking) or "Model No. 1033W17" (locking).
      d. Fire-Rated Cabinets: Provide model numbers with the "-FX2" suffix for fire rated tub option at fire-resistance rated construction.
   2. Requisite Properties:
      a. Door Style: "Vertical Duo" with tempered safety glass.
      b. Tub Size: 10-1/2 inches wide by 24 inches high by 6 inches deep.
      c. Frame Size: 13-5/8 inches wide by 27-1/8 inches.

d. Non-Rated Cabinet Rough Opening Size: 11-1/2 inches wide by 25 inches high by 6-1/8 inches deep.
e. Fire-Rated Cabinet Rough Opening Size: 12-13/16 inches wide by 26-5/16 inches high by 6-11/16 inches deep.
f. Finish: Stainless steel No. 6 (satin) finish.
g. Door Hardware: Standard pull handle with “Saf-T-Lok”, or equal where indicated as locked.

C. Accessories:
1. Mounting Brackets:
a. Provide manufacturer's standard brackets sized as required for specified extinguishers; manufacturer's standard finish.
b. Provide brackets for all extinguishers, including those mounted in cabinets. Provide manufacturer’s standard J-hook wall brackets for extinguishers installed within fire extinguisher cabinets.
2. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.
C. Evaluation and Assessment:
1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
1. Install fire protection specialties using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed fire protection specialties must be warrantable. Do not install, correct, or replace fire protection specialties in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach fire protection specialties to supporting construction.

C. Installation Tolerances: Install fire protection specialties to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet fire extinguisher cabinet door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 CLEANING

A. Cleaning Work: Clean all visible fire extinguisher cabinetsurfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed fire protection specialties in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed fire protection specialties unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed fire protection specialties as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 11

EQUIPMENT

SECTION 11 3110
CONFERENCE ROOM APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conference room appliances.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the appliance manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished appliances.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
   1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Appliances must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
   3. All appliances must be Energy-Star Rated.
   4. Equal products and substitutions must match dimensions of appliances indicated, and be submitted for Architect's approval with documentation evidencing that proposed appliance dimensions are not larger than those indicated.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective appliances with undamaged new appliances that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide product manufactured by one of the following, or equal.

1. Frigidaire.
2. GE Appliances.
3. KitchenAid.
4. Sharp Electronics Corporation.
5. Summit Appliance.

2.2 CONFERENCE ROOM APPLIANCES

A. Undercounter Refrigerator:

1. Product: "FF195ADA" manufactured by Summit Appliance, or equal.
2. Requisite Properties:
   a. Height: 32 inches.
   b. Width: 19 inches.
   c. Depth: 18 inches.
   d. Capacity: 13.3 cubic feet.
   e. Finish: Stainless steel.

B. Microwave Oven: “SMD2489ES” manufactured by Sharp Electronics Corporation or equal.
   1. Requisite Properties:
      a. Width: 24 inches.
      b. Capacity: 1.2 cubic feet.
      c. Finish: Stainless steel.

2.3 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:
   1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
   2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:
   1. Install appliances using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   2. Set items true to line, to required levels and lines, and plumb, level, and square, and in alignment with adjacent construction
   3. Installed appliances must be warrantable. Do not install, correct, or replace appliances in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach appliances to supporting construction and to safely connect facility services.

C. Installation Tolerances: Install appliances to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible appliance surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

3.5 PROTECTION

A. Protect installed appliances in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed appliances unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed appliances as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 11 3113

KITCHEN APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Kitchen appliances.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the appliance manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished appliances.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.

1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Appliances must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
3. All appliances must be Energy-Star Rated.
4. Equal products and substitutions must match dimensions of appliances indicated, and be submitted for Architect's approval with documentation evidencing that proposed appliance dimensions are not larger than those indicated.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective appliances with undamaged new appliances that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Bosch Home Appliance.
2. Frigidaire.
3. GE Appliances.
4. KitchenAid.
5. KoolMore.
6. Sharp Electronics Corporation.

2.2 KITCHEN APPLIANCES

A. Refrigerator:

1. Products: "GRFN2023AF" French door refrigerator manufactured by Frigidaire, or equal.
2. Requisite Properties:
   a. Height: 68-7/10 inches.
   b. Width: 30 inches.
   c. Depth with Door: 31 inches.
   d. Capacity: 20 cubic feet.
   e. Finish: Stainless steel.

B. Electric Oven:

1. Products: “Series 8 Model CMG656BB6B” manufactured by Bosch Home Appliance, or equal.
2. Requisite Properties:
    a. Height: 17.91 inches.
    b. Width: 23.38 inches.
    c. Depth: 21.57 inches.
    d. Finish: Black.

C. Electric Stove:

1. Products: “Series 6 Model PVQ811H26E” manufactured by Bosch Home Appliance, or equal.
2. Requisite Properties:
    a. Top width: 28.9 inches.
    b. Top depth: 20.5 inches.
    c. Height: 8.8 inches.
    d. Depth: 19.3 inches.
    e. Exhaust Diameter: 3.5 inches.
    f. Finish: Black.

D. Microwave Oven: “SMD2489ES” manufactured by Sharp Electronics Corporation or equal.

1. Requisite Properties:
    a. Width: 24 inches.
    b. Capacity: 1.2 cubic feet.
    c. Finish: Stainless steel.

E. Dishwasher:

1. Products: “SPE68C75UC” manufactured by Bosch Home Appliance, or equal.
2. Requisite Properties:
    a. Height: 32-1/16 inches.
    b. Width: 17-5/8 inches.
    c. Depth: 22-9/16 inches.
    d. Finish: Stainless steel.

2.3 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install appliances using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, and in alignment with adjacent construction
3. Installed appliances must be warrantable. Do not install, correct, or replace appliances in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach appliances to supporting construction and to safely connect facility services.

C. Installation Tolerances: Install appliances to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible appliance surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

3.5 PROTECTION

A. Protect installed appliances in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed appliances unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed appliances as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 12

FURNISHINGS

SECTION 12 2213
DRAPERIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Draperies.
   2. Drapery tracks.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the drapery manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
   3. Samples:
      a. Submit at least 8-inch square representative samples of each drapery color, finish, and variety.
      b. Submit at least 8-inch long representative samples of each drapery track type, color, finish, and variety.
      c. Submit representative samples of each drapery hardware variety and finish.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Submit manufacturer-prepared published instructions for proper installation of furnished draperies.

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit copies of manufacturer's instructions and other requirements and recommendations for drapery maintenance, cleaning, and repair to the Architect as a condition of project closeout.

1.4 QUALITY ASSURANCE

A. Source Limitations:
1. Draperies must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective draperies with undamaged new draperies that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 DRAPERIES

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 DRAPERY TRACKS

A. Products: Indicated on the Drawings or selected by the Architect, or equal.

2.3 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install draperies using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed draperies must be warrantable. Do not install, correct, or replace draperies in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach draperies to supporting construction.

C. Installation Tolerances: Install draperies to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet drapery operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed draperies in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed draperies unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed draperies as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 12 2413
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roller window shades.
   2. Shade operation.
   3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:
   1. Manufacturer: Means the window shade manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
   3. Samples: Submit at least 8-inch square representative samples of each window shade shadecloth color, finish, and variety.

B. Informational Submittals: Submit the following for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Manufacturer's Instructions: Submit manufacturer-prepared published instructions for proper installation of furnished window shades.
      a. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.

b. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

2. Qualification Statements: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Window shades must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. Receiving and Inspection: Inspect all deliveries for deteriorated, damaged, and defective items. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.

B. Unloading: With minimum handling, unload and store only inspected and accepted items.

C. Storage: Store unloaded items as shipped, upright in their original packaging or containers, indoors within dry, well-ventilated, broom-cleaned, and partially- or permanently-enclosed storage areas.

D. Damaged Item Replacement: Promptly remove and replace items that are deteriorated, damaged, or defective with undamaged new items that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Draper, Inc.
   2. Lutron Electronics Co., Inc
   3. MechoShade Systems, Inc.

2.2 ROLLER WINDOW SHADES

A. Products: Provide products manufactured by MechoShade Systems, Inc., or equal.

B. Requisite Properties:
   1. Model: DesignSelections indicated on the Drawings or selected by the Architect, or equal.
   2. Sunscreen Shadecloth: “ThermoVeil 1300 Series”, or equal.
      a. Material: 75 percent PVC (coating), 25 percent polyester (yarn).
      b. Size: Fabric width to match window mullion spacing.
      c. Minimum Thickness: At least 30 mils.
      d. Total Weight: 13.5 ounces per square yard.
      e. Openness Factor: 3 percent open.
      f. Color: ProductOptions indicated on the Drawings or selected by the Architect.
      g. Pattern: Basket weave.
      h. Bottom Hem: Straight.
      i. Maximum Total Solar Energy Transmitted: (Ts) not more than 4.
      j. Minimum Total Solar Energy Reflected: (Rs) at least 5.
      k. Minimum Total Solar Energy Absorbed: (As) at least 91.
      l. Minimum Visible Light Transmitted: (Tv) at least 4.
   3. Blackout Shadecloth: “Classic Blackout 0700 Series”, or equal
      a. Material: 75 percent PVC (coating), 25 percent polyester (yarn).
      b. Size: Fabric width to match window mullion spacing.
      c. Minimum Thickness: At least 32 mils.
      d. Total Weight: 17.6 ounces per square yard.
      e. Openness Factor: 0 percent open.
      f. Color: ProductOptions indicated on the Drawings or selected by the Architect.
      g. Pattern: Tightly-woven linear weave.
      h. Bottom Hem: Straight.

4. Mounting: Ceiling mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
5. Direction of Roll: Regular or reverse roll.
6. Operation: Manual operation.

C. Performance Requirements:
1. Fire Resistance: Provide shade fabrics tested in conformance with NFPA 701, small scale Vertical Burn Test, and rated “PASS”.
2. Toxicity: Provide shade fabrics tested in accordance with University of Pittsburgh Toxicity Protocol including LC50 analysis and toxicity characteristics.
3. Anti-Microbial: ASTM G 21 results indicating “No Growth”; ASTM G 22 results indicating minimum 0.197-inch “No Growth Contact Area”.

2.3 COMPONENTS

A. Rollers: Either electro-galvanized or epoxy-primed steel, or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated.

B. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.

C. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated; removable design for access.

D. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

E. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

F. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

G. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.

2.4 SHADE OPERATION

A. Manual Shade Operation:

1. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
2. Loop Length: Continuous-loop bead-chain with loop length equal to full length of roller shade.
3. Bead Chain: Stainless steel.

B. Motorized Shade Operation:

1. Description: Factory-assembled motorized shade operation systems, listed and labeled as defined in NFPA 70, Article 100, and designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
2. Control Equipment: Conforming to NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V AC or DC.
3. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
4. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure surface mounting. Rocker-style wall switch.
5. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

2.5 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install window shades using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed window shades must be warrantable. Do not install, correct, or replace window shades in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach window shades to supporting construction.

C. Installation Tolerances: Install window shades to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet window shade operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 PROTECTION

A. Protect installed window shades in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed window shades unless they are protected from damage, as accepted in writing by the manufacturer's representative.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 12 3663
SOLID SURFACE MATERIAL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surfacing countertops.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the solid surfacing manufacturer, unless otherwise indicated.
2. Fabricator: Means the countertop fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate countertops to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)

2. Shop Drawings:
    a. Submit dimensioned plans drawn to scale and showing countertop layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
    b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans.
    c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
3. Samples: Submit at least 8-inch square representative samples of each solid surfacing color, finish, and variety.

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

C. Closeout Submittals:
1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for countertop maintenance, cleaning, and repair to the Architect as a condition of project closeout.
2. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:
1. Countertops must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
    a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
    b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Fabrication Standard: Provide countertops conforming to Architectural Woodwork Institute/ Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing countertop material installed on previous projects similar to this project in size, material, design, and complexity.
2. Fabricator: Company or individuals must have experience fabricating countertops installed on previous projects similar to this project in size, material, design, and complexity
3. Installer: Company or individuals must have experience installing countertops for previous projects similar to this project in size, material, design, and complexity.
4. Supervisors: Individuals must have experience installing countertops for previous projects similar to this project in size, material, design, and complexity, including a supervisory experience directing and leading countertop installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective countertops with undamaged new countertops that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 SOLID SURFACING MATERIAL

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 ACCESSORIES

A. Adhesive: Structural-grade silicone or epoxy adhesives of type recommended or accepted by manufacturer for conditions of use. Tint adhesive visible in finished work to match countertop materials.

B. Mounting Spacers: Supplied, required, recommended, or accepted by the adhesive manufacturer, if required.

C. Sealant:

1. Description: White or clear, medium or high modulus, mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.
2. Products: "786" manufactured by Dow Corning Corp., or "Sanitary SCS 1700" manufactured by Momentive Performance Materials, Inc., or equal.

D. Solvent: Supplied, required, recommended, or accepted by the manufacturer to clean countertop surfaces to ensure adhesion of adhesives and sealants.

E. Cleaning Agents: Provide non-abrasive cleansers supplied, required, recommended, or accepted by the manufacturer.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 FABRICATION

A. Shop-fabricate countertops to sizes and shapes indicated on the Drawings and in largest sections practicable to minimize field jointing.

B. Fabricate exposed work precise, straight, and true to line, size, and shape; square and within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.

C. Cut, drill, and punch countertops as required to receive other components, accessories, hardware, and similar items, and as required to securely attach to supporting construction. Provide openings and similar features as needed to accommodate adjacent work.

D. Carefully inspect finished units at the shop for conformance to specified requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install countertops using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed countertops must be warrantable. Do not install, correct, or replace countertops in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Shim as required using concealed shims.
2. Scribe and fit accurately against adjacent surfaces for a close fit.
3. Attach countertops securely to supports with concealed screws as required for a rigid and secure installation.
4. Seal interface of countertops with contiguous surfaces with sealant.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach countertops to supporting construction.

D. Installation Tolerances: Install countertops to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed countertops in place from deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed countertops unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed countertops as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 12 3664
QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the countertop manufacturer, unless otherwise indicated.
2. Fabricator: Means the countertop fabricator, unless otherwise indicated.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Schedule countertop deliveries to the project site only after the building is enclosed with a permanent enclosure; “wet work” within storage areas (including concrete, cast underlayment, mortaring, grouting, plastering, and gypsum board finishing) is complete and cured or dried to a condition of equilibrium; storage areas are broom- and vacuum-clean; and the HVAC system is activated, operating, and maintaining ambient conditions at occupancy levels.
2. Install countertops only after all other finishing operations are complete, especially overhead finishes.
3. After countertop installation, maintain ambient conditions within design range until Final Completion.

B. Scheduling:

1. Acclimation: Allow sufficient time in the construction schedule to acclimate countertops to specified ambient conditions for between 72 hours and 6 weeks before installation begins, or until moisture content is not more than 8 percent, when measured with a moisture meter at specified ambient conditions.

1.4 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Shop Drawings:
   a. Submit dimensioned plans drawn to scale and showing countertop layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.
   b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans.
   c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

C. Closeout Submittals:

1. Maintenance Data: Submit copies of manufacturer's instructions and other requirements and recommendations for countertop maintenance, cleaning, and repair to the Architect as a condition of project closeout.
2. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Countertops must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Quality Standards:

1. Fabrication Standard: Provide countertops conforming to Architectural Woodwork Institute/ Architectural Woodwork Manufacturer's Association of Canada/ Woodwork Institute publication "*Architectural Woodwork Standards*" requirements for each specified Grade.

C. Qualifications: *(The Contractor will provide verification to the County upon request and/or prior to the start of this work)*

1. Manufacturer: Company or individuals must have experience manufacturing countertop material installed on previous projects similar to this project in size, material, design, and complexity.
2. Fabricator: Company or individuals must have experience fabricating countertops installed on previous projects similar to this project in size, material, design, and complexity
3. Installer: Company or individuals must have experience installing countertops for previous projects similar to this project in size, material, design, and complexity.
4. Supervisors: Individuals must have experience installing countertops for previous projects similar to this project in size, material, design, and complexity, including supervisory experience directing and leading countertop installers.

1.6 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
1. Furnish adequate dunnage and bracing during storage.
2. Prevent stored items from contacting the floor, from soiling and staining, and from deterioration and damage.
3. Do not leave items uncovered where they might be exposed to weather or become wet; or exposed to heat or sudden changes in temperature or relative humidity; or other sources of deterioration and damage, including dust and other airborne contaminants.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective countertops with undamaged new countertops that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.7 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products and accessories against all patent and latent defects, and incipient and catastrophic failure for 5 years.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOPS

A. Product: Indicated on the Drawings in the Finish and Material Schedules, Sheet A8.51, or equal.

2.2 ACCESSORIES

A. Construction Adhesive:
1. Description: General purpose, indoor or outdoor, drillable, moisture resistant, sandable, heavy duty construction adhesive.
2. Product: "Titebond PROvantage" manufactured by Franklin International, or equal.

B. Mounting Spacers: Supplied, required, recommended, or accepted by the adhesive manufacturer, if required.

C. Sealant:

1. Description: Clear, medium or high modulus, mildew-resistant silicone sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 25, Use NT, A or O sealant, as applicable.

2. Products: Provide “786” manufactured by Dow Corning Corp., or “Sanitary SCS 1700” manufactured by Momentive Performance Materials, Inc., or equal.

D. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the fabricator for actual in-service conditions applicable to the project.

E. Cleaner: Supplied, required, recommended, or accepted by the manufacturer for use on installed countertops and actual in-service conditions applicable to the project. Cleaners must remove stains, dirt, and residue without damaging or altering countertop surfaces.

F. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.3 FABRICATION

A. Shop-fabricate countertops to sizes and shapes indicated on the Drawings and in largest sections practicable to minimize field jointing.

B. Fabricate exposed work precise, straight, and true to line, size, and shape; square and within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.

C. Cut, drill, and punch countertops as required to receive other components, accessories, hardware, and similar items, and as required to securely attach to supporting construction. Provide openings and similar features as needed to accommodate adjacent work.

D. Carefully inspect finished units at the shop for conformance to specified requirements for appearance, material, and fabrication. Replace defective units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install countertops using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
4. Installed countertops must be warrantable. Do not install, correct, or replace countertops in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:

1. Shim as required using concealed shims.
2. Scribe and fit accurately against adjacent surfaces for a close fit.
3. Attach countertops securely to supports with concealed screws as required for a rigid and secure installation.
4. Seal interface of countertops with contiguous surfaces with sealant.

C. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach countertops to supporting construction.

D. Installation Tolerances: Install countertops to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible surfaces in a manner that does not result any warranty or guarantee becoming void.

   1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
   2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
   3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
   4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed countertops in place from deterioration, and damage until Substantial Completion.

B. Do not store anything on, adjacent to, or against installed countertops unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed countertops as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13 3419

METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated metal buildings.
2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the metal building manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished prefabricated buildings.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit copies of manufacturer's instructions and other requirements and recommendations for metal building maintenance, cleaning, and repair to the Architect as a condition of project closeout.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Prefabricated buildings must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective prefabricated buildings with undamaged new prefabricated buildings that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide buildings manufactured by one of the following, or equal.

1. Falcon Structures.
2. Box Hub.
3. American Buildings Company.
4. Butler Builders.
5. Star Building Systems.
6. Varco Pruden.

2.2 METAL BUILDINGS

A. Description: Coil-coated galvanized steel pre-engineered and pre-fabricated metal buildings assembled at the project site.

B. Product: “Falcon Structures 20-Foot Climate Controlled Storage Container with Personnel Door (AC462 code compliant)” manufactured by Falcon Structures, or equal.

C. Requisite Properties:

1. Exterior: 20 feet long by 8 feet wide by 8 feet 6 inches high.
2. Interior: 19 feet long by 7 feet 6 inches wide by 7 feet 5 inches high.
3. Square Feet: 160 square feet.
4. Doors: One 3-foot-wide exterior industrial personnel door. Operable cargo doors.
5. Door Height: 82.7-inches.
6. Flooring: Marine-grade plywood or bamboo, as selected by the Architect.
7. Color: Selected by the Architect.
8. Insulation: 1-inch Styrofoam on interior walls, 2 inches on ceiling.
9. Cooling and Heating: One PTAC unit with 15k BTU cooling, 3.5 kW heating capacity.
10. Shelf: Built in shelf bracket.
11. Ventilation: 2-4 small vents fabricated from A.B.S. resin.
12. Lighting: Two standard 4-foot LED light fixtures. One exterior security light adjacent to the personnel door.
13. Outlet: One duplex GFI outlet.

2.3 ACCESSORIES

A. Bracing System: Conform to requirements of Metal Building Manufacturers Association.

B. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install prefabricated buildings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed prefabricated buildings must be warrantable. Do not install, correct, or replace prefabricated buildings in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach prefabricated buildings to supporting construction and to safely connect facility services.

C. Installation Tolerances: Install prefabricated buildings to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect’s acceptance.

3.4 PROTECTION

A. Protect installed prefabricated buildings in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on. adjacent to, or against, or within installed prefabricated buildings unless the building is protected from damage, as accepted in writing by the manufacturer’s representative. Do not use installed prefabricated buildings as work spaces.

C. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 14

CONVEYING EQUIPMENT

SECTION 14-2400
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes one (1) hydraulic elevators as follows:

1. Dual Jack holeless hydraulic passenger elevator, Car 1.

B. Products Installed but Not Furnished Under This Section:

1. Emergency voice/alarm communication system provisions.
2. CCTV camera provisions.
3. Elevator security devices, control unit, mounting brackets, wiring materials, logic circuits, security system interface terminals, boxes and relays.
4. Car interior finishes.
5. Car flooring.

1.2 ALLOWANCES

A. Elevator Car Allowances:

1. Allowance includes furnishing and installing the following:
   a. Car wall finishes including trim.
   b. Car floor finishes including subfloor and fastening.
   c. Car ceiling finishes including lighting, wiring, and coordination of battery-operated emergency lighting.
   d. Car door sills.
   e. Handrails.
   f. Cutouts and other provisions for installing elevator signal equipment in cars.
   g. Mounting for protective pads.
   h. Assistance of IUEC installers.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Include capacities, sizes, performances, operation, control, signal systems operations, safety features, finishes, and similar information.
2. Include product data for car enclosures and hoistway entrances.
3. Include product data for signal fixtures, lights, graphics, Tactile marking plates, and details of mounting.

B. Shop Drawings:

1. All shop drawings submitted must be signed and sealed by an Engineer licensed in the state where the vertical transportation system is being installed.
2. Provide scaled shop drawings and construction drawings of the following:

a. Plan and section layouts of hoistways, pits, overheads, machinery spaces and openings at each landing, to include the following:
    1) Location of all equipment.
    2) Static and dynamic loads imposed on building structure.
    3) Details of equipment isolation.
    4) Required clearances around equipment.
    5) Machine room heat release.
    6) Power Requirements:
        a) Motor horsepower, code letter, starting current, full load running current, and demand factor.
        b) Provide engineered power consumption based on 80 starts per hour.
        c) Provide maximum and average power consumption.
    7) Service connections.
    8) Running clearances.
    9) Location of fixtures.
b. Elevation section of hoistways:
    1) Overhead, pits, clearance, and runby.
    2) Entrance details.
    3) Sill support detail.
c. Pit Equipment:
    1) Buffers.
    2) Pit reactions.
    3) Service ladder.
    4) Stop switches.
d. Elevator cabs:
    1) Car shell fabrication.
    2) Ventilation.
    3) Ceiling construction detail.
    4) Wall construction detail.
    5) Lighting detail.
    6) Handrail mounting detail.
    7) Transom, front returns.
e. Fixtures:
    1) Car operating panel.
    2) Hall stations.
    3) Hall lanterns.
    4) Position indicators.
    5) Access key switch.
    6) Two-way communication device (all master stations).

3. All submittals shall be clearly marked and identified with project title and appropriate device identification.
4. All submittals are subject to approval.
5. Corrections requested shall be incorporated onto the submittals.
6. All submittals delivered via Portable Document Format (.pdf).

C. Samples for Initial Selection: For finishes involving surface treatment, paint or color selection.

D. Samples for Verification:
1. For exposed car, hoistway door and frame, and signal equipment finishes.
2. Samples of Sheet Materials: 3" square.
3. Running Trim Members: 4" lengths.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: The following record documents shall be furnished upon completion and before final payment:
1. Shop Drawings:
a. Complete sets of as installed plan and section layouts of hoistways, pits, overheads and equipment spaces, to include the following:
1) Loads imposed on building structure.
2) Details of equipment isolation.
3) Required clearances around equipment.
4) Machine room heat release/diversity factor.
5) Power requirements.
b. Elevation Section of Hoistways: Overhead, pits, and entrance details.
c. Elevator cabs.
d. Fixtures:
1) Car fixtures.
2) Hall fixtures.
3) Remote fixtures.
e. Machine room heat release and power requirements.
2. Wiring Diagrams:
a. Complete sets of as installed straight-line wiring diagrams, showing the electrical connections of all altered vertical transportation equipment, shall be furnished upon completion.
b. A legend sheet shall be furnished with each set of drawings containing the following information:
1) Name and symbol of each relay, switch and other electrical or solid-state apparatus.
2) Location on drawings, drawing sheets, number and area of switches and relays, etc., and location of all contacts.
3) Location of apparatus whether on controller, hoistway or elevator cab.

3. Maintenance and Operating Manuals:
    a. Description and sequence of operation of all equipment installed, including operating use for Building Personnel and tenants, as well as system troubleshooting manuals for technicians.
    b. Maintenance instructions and procedures of all vertical transportation equipment installed, including parts lists, for each elevator system.
    c. Lubrication charts indicating all lubricating points and type of lubricant recommended for all equipment.
    d. Complete parts catalogs for all replaceable parts.

B. Tools: The following equipment shall be furnished upon completion and before final payment:
    1. The Elevator Contractor shall provide all the necessary tools, including laptop, hand-held devices, required software and manuals, required to troubleshoot, adjust, synchronize, calibrate, repair and maintain the vertical transportation systems, as well as perform all necessary procedures to perform all safety tests as required by code and local governing authority.
    2. Owner's equipment and software shall be updated regularly to properly troubleshoot, adjust, synchronize, calibrate, repair, maintain, and test the vertical transportation systems. All equipment and/or software shall be of the same version as issued to technicians maintaining the vertical transportation systems.
    3. The Elevator Contractor shall provide a backup copy of any software that resides on the troubleshooting tool.

C. Keys:
    1. Four sets of keys to operate all keyed switches and locks shall be furnished upon completion.
    2. Keys shall be properly tagged.
    3. All keying shall be arranged with the Contractor.

1.5 PERMITS, TESTS, AND CERTIFICATES

A. Permits:
    1. The Elevator Contractor shall secure the necessary permits required for work to be performed, including work performed by sub-contractors.
    2. The Elevator Contractor shall obtain and pay for all municipal and state permits necessary for execution of the elevator work, including fees for renewing permits.
    3. The Elevator Contractor shall be responsible for posting all permits as required by the AHJ.
    4. The Elevator Contractor shall be responsible for obtaining final sign-off and approval for each permit filed by them.

B. Tests and Inspections:
    1. The Elevator Contractor shall perform all necessary tests as required by ASME A17.1 and recommended by A17.2.

2. The Elevator Contractor shall be responsible for scheduling the necessary tests as required by the local authorities.
3. Any fees associated with a missed appointment, expediting of test or overtime test due to delays caused by the Elevator Contractor shall be the responsibility of the Elevator Contractor.

C. Certificates:
1. Elevator Contractor is responsible for obtaining and providing Contractor with all temporary and final inspection certificates of the proper governing authorities and shall provide the Contractor with such certificates.
2. The Elevator Contractor shall pay for all fees necessary for obtaining temporary and final inspection certificates.

1.6 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies: Comply with most stringent provisions of codes, laws, and/or authorities, including revisions and changes in effect:

B. The Elevator Contractor is subject to reviews by the Consultant and/or Contractor at any time throughout the project.

1.7 DELIVERY, STORAGE, AND HOISTING

A. General:
1. The protection of all equipment and exposed finishes shall be the responsibility of the Elevator Contractor during delivery, handling and installation until completion of project.
2. The Elevator Contractor shall replace damaged materials with new, at no additional cost for material and labor to Contractor.

B. Delivery and Storage:
1. It is expected that manufacturers’ original packing shall adequately protect materials during delivery.
2. Deliver materials to the site ready for use in the accepted manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to accepted samples.
3. Store materials under cover in a dry and clean location, off the ground. Remove delivered materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.
4. It is the responsibility of the Elevator Contractor to properly store and protect all materials in space provided or designated by the Contractor against damage, stains, scratches, corrosion, weather, construction debris and environmental conditions.

C. Hoisting: All required hoisting and movement of equipment shall be the responsibility of the Elevator Contractor.

1.8 COORDINATION

A. General: Coordinate the following requirements with the other trades.

B. Cast-in-Place Concrete:

1. Elevator Contractor to provide guide rail bracket inserts and the locations for the General Contractor to install.
2. Elevator Contractor to provide templates for machine room slab penetrations.
3. Provide other hoistway and pit requirements, including location of sump pits.

C. Masonry Penetrations:

1. Provide locations in elevator machine room/hoistway walls where conduit, ropes, oil lines, etc. will penetrate walls and slabs.
2. Coordinate installation of sleeves, block outs, inserts, and items that are embedded in concrete or masonry for elevator equipment.
3. Furnish inserts, templates and installation instructions and deliver to Project site in time for installation.

D. Structural Steel: Including, but not limited to, elevator machine rooms, hoistways and pits, sill supports, rail supports.

E. Miscellaneous Steel: Pit ladders, working platforms, inspection platforms, guard rails, divider beams.

F. Electric: Electrical service, mainline disconnects, 110 VAC disconnects, outlets, lights, switches in elevator machine rooms and pits.

G. Sprinklers: Including installation of sprinkler systems in the elevator pits or shafts as per NFPA 13.

H. HVAC: Provide necessary information to General Contractor and coordinate installation of equipment for elevator machine rooms.

I. Finishes: Cab interiors, hoistway entrances, fixtures.

J. Elevator Cab Flooring:

1. Material and finish to be specified in other applicable section.
2. Flooring installation must be coordinated to ensure car saddle is installed level with finished floor.

K. Security Equipment: Coordinate locations in elevator machine rooms and cabs where cables, conduit, components, etc. for CCTV and/or secure access interface equipment must be installed.

1.9 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

B. Warranty Period: 12 months from date of Substantial Completion.

1. The Elevator Contractor shall guarantee that the materials and workmanship of the apparatus installed by them and any subcontractor, under this contract, shall be first class in every respect and that he will make good on any defects not due to ordinary wear and tear or improper use, which may develop within one year from the date of final acceptance of all equipment.

2. Manufacturer's warranty to repair or replace defective products or their components in the event of defects within a specified period.
3. Neither the final payment nor any provisions of the contract documents shall relieve the Elevator Contractor of the extent and period provided by law and upon written notice he shall remedy any defects due thereto and pay all expenses for any damage to other work resulting there from.
4. The warranty as outlined above, for all devices, shall start from the date of final acceptance of each device, by the Consultant and the Owner, of all work specified and intended under these contract documents.

1.10 MAINTENANCE

A. General:
1. All maintenance shall be performed according to the guidelines stated in manufacturer's Maintenance and Operations manuals.
2. Maintenance records for each device, including lubrication logs, check charts, shall be provided in each machine room.

B. Construction Maintenance:
1. Upon substantial completion of a device, after receiving sign-off from the governing authorities and acceptance from Consultant and/or Contractor, the device may be accepted for service before completion of the entire project.
2. During the Construction Maintenance period, the necessary preventive maintenance shall be performed on a scheduled basis.
3. Provide the necessary protection of the hoistway entrances and sills, hoistway fixtures, cab interiors and fixtures and car door sills.
4. Replacement or repair of components due to misuse by others, shall be the responsibility of the Contractor/Owner.
5. Perform emergency callback service during normal working hours.
6. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of sixty minutes or less.

C. Warranty Maintenance:
1. Upon final acceptance of each device, after Construction Maintenance period, subsequent to receiving acceptance and sign-off from the governing authorities and final acceptance, each device shall be accepted for full operation.
2. The warranty maintenance period shall begin for each device when all conditions in the above paragraph are met and will continue for the specified period.
3. Warranty Maintenance Period may begin at different times for each elevator.
4. The warranty maintenance program shall include the following:
   a. Monthly examinations, including adjustments, cleaning and lubrication of equipment.
   b. 24-hour Emergency Call back service shall be provided at no additional cost to Owner.

c. Replacement of components as required, using only components produced by the original manufacturer.

d. Each machine room shall be equipped with a lockable storage cabinet to contain the necessary spare parts.

D. Maintenance Agreement: Upon completion of the Warranty Maintenance period, the Elevator Contractor will provide the personnel to service the vertical transportation equipment.

1. Full-Service Maintenance Agreement shall commence upon the completion of the warranty maintenance period for a term of five years.

2. If specifications for a comprehensive service agreement have not been provided, then the Contractor shall provide a proposal for a full-service agreement which covers the following:

a. All required inspections and tests.

b. 24-hour emergency call service at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 REFERENCES

A. Definitions: Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

B. American National Standard Institute (ANSI): A117.1, Accessible and Usable Buildings and Facilities

C. American Society of Mechanical Engineers: ASME A17.1, Safety Code for Elevators and Escalators.

1. ASME A17.2, Guide for Inspection of Elevators, Escalators, and Moving Walks

2. ASME A17.5, Elevator and Escalator Electrical Equipment

3. ASME A17.6, Standard for Elevator Suspension, Compensation, and Governor Systems

D. California Code of Regulations:

1. Title 8, Chapter 4, Subchapter 6, Elevator Safety Orders.

2. Title 24, Part 2, California Building Code (CBC).

3. Title 24, Part 3 California Electrical Code.

4. Title 24, Part 9, California Fire Code.

E. National Fire Protection Association (NFPA):

1. NFPA 13, Installation of Sprinkler Systems.

2. NFPA 70, National Electric Code.

3. NFPA 80, Fire Doors and Windows.

4. NFPA 101, Life Safety Code.

F. Accessibility:

1. California Building Code (CBC), Chapter 11B-407.

2.2 MANUFACTURERS

A. Subject to compliance with project requirements, provide products by one of the following:

1. Controllers:
    a. Mitsubishi Electric Corporation.
    b. Otis Elevator Company.
    c. Schindler Elevator Corporation.
    d. TK Elevator Corporation.
    e. MCE.
2. Hoistway Entrances:
    a. KONE Incorporated.
    b. Mitsubishi Electric Corporation.
    c. Otis Elevator Company.
    d. Schindler Elevator Corporation.
    e. TK Elevator Corporation.
    f. Wittur.
    g. Columbia.
3. Passenger Elevator Door Equipment (Operators, Tracks, Hangers, and Closers):
    a. KONE Incorporated.
    b. Mitsubishi Electric Corporation.
    c. Otis Elevator Company.
    d. Schindler Elevator Corporation.
    e. TK Elevator Corporation.
    f. GAL.
    g. Wittur.
4. Elevator Car Enclosures:
    a. EDI/ECI.
    b. Elite Cabs.
    c. Globe Architectural & Metal.
    d. National.
    e. Regency Elevator Cabs.
    f. Manufacturers Standard.
5. Fixtures Standard, Vandal Resistant.:
    a. EPCO.
    b. Monitor.
    c. Innovation.
    d. National Elevator Cab and Doors.
    e. MAD Fixtures.
6. Two-Way Communication Device:
    a. RingComm.

b. EMS.

2.3 FIELD CONDITIONS

A. Seismic:

1. Elevator system shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and shall comply with elevator safety requirements for seismic risk Zone 2 or greater in ASME A17.1/CSA B44.
2. The term “withstand” means the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.
3. Provide earthquake equipment required by ASME A17.1/CSA B44.
4. Provide Alpha-Numeric display if Earthquake Mode is needed.
5. Provide seismic switch required by SEI/ASCE 7.
6. Design earthquake spectral response acceleration short period (Sds): 1.291
7. Occupancy Category: TBD.
8. Project Seismic Design Category: D.
9. Elevator Component Importance Factor (Ip): 1.5

2.4 PERFORMANCE REQUIREMENTS

A. Car Speed: +10%/-20% for standard hydraulic application.

B. Car Capacity: Safely lower, stop, and hold 125% of rated load.

C. Car Stopping Zone: ±1/4" under any loading condition.

D. Door Times: Seconds from start to fully open or fully closed:

1. Car 1: Door Open: 3.1 seconds; Door Close: 4.0 seconds.

E. Car Floor-to-Floor Performance Time: Seconds from start of doors closing until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors, and car is level and stopped at next successive floor under any loading condition or travel direction:

1. Car 1: 14.61 seconds; floor height 10’-2 ¾” between floors 1 and 2.

F. Pressure: Fluid system components shall be designed for maximum operating pressure of 500 psi.

G. Car Ride Quality:

1. Acceleration and Deceleration: Smooth constant and not less than 1.5 feet/second^2 with an initial ramp between 0.5 and 0.75 second.
2. Sustained Jerk: Not more than 6 feet/second^3.
3. Horizontal and vertical acceleration within car during all riding and door operating conditions: Not more than 15 mg peak-to-peak (adjacent peaks).
4. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.

H. Noise and Vibration Control:

1. Airborne Noise:
    a. Measured noise level of elevator equipment and its operation shall not exceed 55 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.
    b. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA.
    c. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the “A” weighted scale.
2. Vibration Control: All elevator equipment shall be mechanically isolated from the building structure and other components to minimize objectionable noise and vibrations being transmitted to occupied areas of the building.

2.5 ELEVATORS

A. Elevator System, General:
    1. Manufacturer’s standard elevator systems.
    2. Unless otherwise indicated, manufacturer’s standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Passenger Elevator Description:
    1. Elevator Identification: Car 1
    2. Capacity: 3,500 lbs.
    3. Class of Loading: Class A.
    4. Contract Speed: 125 fpm.
    5. Machine: Hydraulic pump.
    6. Machine Location: Remote at bottom landing.
    7. Control System: Collective Microprocessor based- Single automatic.
    8. Motor Control: Single speed AC with electronic soft start with closed transition.
    9. Floors Served: All front.
        a. Front: B, 1-2
    10. Openings: All front.
        a. Front 3.
    11. Minimum Clear Height to Underside of Canopy: 8’-0” high.
    12. Entrance Size: 3'-6" wide x 7'-0" high.
    13. Entrance Type: Single-speed side-opening.
    14. Hydraulic Type: Dual jack holeless.

2.6 MATERIALS

A. General: All materials and finishes are subject to approval by Architect.

B. Steel:
    1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.

2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
3. Structural Steel Shapes and Plates: ASTM A36.

C. Stainless steel:
1. Type 302, 304 or 316 series complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability.
2. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
3. No. 4 Satin:
   a. Directional polish finish.
   b. Graining directions as shown or, if not shown, in longest dimension.
4. Textured:
   a. .050" mean pattern depth with bright directional polish (No. 4 satin finish).
   b. 5WL as manufactured by Rigidized Metals.
   c. Windsor pattern 5-SM as manufactured by Rimex Metals.

D. Aluminum:
1. Extrusions per ASTM B221; sheet and plate per ASTM B209.
2. Die Cast Aluminum, ASTM B108, Alloy 356.0, T6.
3. Extruded Aluminum, FS QQ-A 200/8, Alloy 6061, T6.

E. Plastic Laminate:
1. ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick.
2. Exposed Surfaces: Color and texture selected by Architect.
3. Concealed Surfaces: Manufacturer's standard color and finish.

F. Paint Finishes:
1. General:
   a. Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer.
   b. Galvanized metal need not be painted.
2. Prime Finish:
   a. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces.
   b. Sand smooth and apply final coat of primer.
3. All equipment and metal work installed under this contract, which does not have a baked enamel or special architectural finish, and which is exposed in the hoistway, shall be cleaned and painted one field coat of enamel.
4. All machine room equipment shall be painted upon completion of the installation with the manufacturer's standard machinery enamel.

5. Elevator designation (number and/or letter) shall be prominently indicated on all machine room and machinery space equipment, top of car crosshead and pit equipment.

2.7 OPERATION

A. General:

1. Cars automatically slow down and stop level at floors in response to car and landing calls with stops made in sequence in the established direction of travel, regardless of order in which buttons are pressed.
2. Landing calls canceled when answered.
3. Automatic Leveling: An automatic two-way leveling device shall be provided, designed to govern the leveling of the car to within 1/8” above or below the landing sill. The leveling operation shall be effective to avoid overtravel, as well as undertravel of the car and maintain the leveling accuracy regardless of the load in the car, direction of travel, rope slippage or stretch.
4. Door Control:
   a. A car without registered car calls arriving at a floor where both up and down hall calls are registered, responds to the call in the direction of car travel. If no car call is registered for further travel in that direction, lantern immediately indicates changed direction without closing and reopening doors.
   b. Direction lantern to remain illuminated until doors are fully closed.
5. Independent Service:
   a. Provide controls for operation of each car from its pushbuttons only.
   b. Close doors by constant pressure on desired destination floor button or door close button.
   c. Open doors automatically upon arrival at selected floor.

B. Microprocessor, Selective Collective Operation, Elevator 1:

1. General: Elevators shall operate via car and landing buttons.
2. Operation:
   a. Momentary pressure of one or more car or landing buttons shall activate the elevator.
   b. Momentary pressure of calls, other than calls for landing at which car is standing, will start car, and cause car to stop at first landing for which a call is registered corresponding to direction in which car is traveling.
   c. Stops made in order in which landings are reached, irrespective of sequence in which calls are registered.
3. Parked Car (No Demand):
   a. Elevator may remain at landing of last assignment (if no further demand) with doors closed, for a predetermined amount of time (programmable for any amount of time) if feature is enabled.
   b. If this feature is enabled, upon expiration of time, the elevator shall return to the main egress landing with the doors closed.

4. If this feature is disabled, if no further demand exists, the elevator shall remain at landing of last assignment with the doors closed until a hall call is registered.

C. Hall Lantern Signals:

1. The lantern shall generate signal upon each stop, regardless of responding to car or hall call.
2. An option shall be provided to allow lanterns to be active in response to hall calls only.
3. Lantern shall be provided with signal from controller compliant with ADA requirements.

D. Firefighters' Service: Provide equipment and operation in accordance with code requirements.

E. Motion Control:

1. Microprocessor-based AC variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking.
2. Limit the difference in car speed between full load and no load to not more than ±10% of the contract speed.

F. Standby Lighting, Communication, and Alarm:

1. Car mounted battery unit with solid-state charger to operate alarm bell, car emergency lighting, and voice communication system.
2. Car lighting and communication shall be provided with a minimum of four hours of operation on back-up power during a loss of normal power, and a minimum of one hour of operation for car-mounted alarm.
3. Battery to be rechargeable with minimum five-year life expectancy.
4. Provide constant pressure test button in service compartment of car operating panel.
5. Provide lighting integral with portion of normal car lighting system.

G. Door Operation:

1. Automatically open doors when car arrives at a floor.
2. At expiration of normal dwell time, close doors.
3. Reopen doors when car is designated for loading.

H. Attendant Operation, Elevator 1:

1. Include provision for attendant control of door closing, car direction, and calls answered.
2. Provide two-position key switch in service cabinet to activate Attendant service operation.
3. Electronic buzzer shall be installed to provide audible signal on registration of hall calls.

4. Upon activation of Attendant service, DOOR CLOSE, UP, DOWN and NON-STOP buttons become operational for use by Attendant in car. Constant pressure of DOOR CLOSE, UP or DOWN button causes doors to close and car to proceed in direction corresponding to button pushed or assigned call; car to answer car and hall calls in order in which they are reached.
5. Where front and rear entrances are provided, provisions shall be made to allow the Operator to selectively close either the front or rear door.
6. If direction button or DOOR CLOSE button is released prior to full closure of doors, doors reopen automatically.
7. Change in direction of travel is accomplished by pushing opposite direction button.
8. Constant pressure of NON-STOP button until the elevator is in motion shall cause car to bypass registered hall calls until released; hall calls remain registered until answered.
9. Car calls canceled by pushing UP and DOWN buttons simultaneously or by pushing UP or DOWN button to change direction.

I. Battery Lowering Operation:

1. Upon loss of normal power automatically lower car to the nearest landing depending on position at time of power outage.
2. Upon arrival at the landing, the elevator doors shall open automatically and remain open until regular door time has expired; the elevator shall then be removed from service.
3. The auxiliary power source shall be provided via 12-volt D.C. battery units installed in machine room.
4. Include solid-state charger and testing means mounted in a common metal container.
5. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy.
6. Upon restoration of normal power, the elevator shall automatically resume normal operation.

J. Card/Proximity Reader Security System:

1. Provide provisions inside Car 1 for reader unit.
2. Mount reader unit as directed by Architect and make cross connects to card reader terminal interface and relays in machine room.
3. Provide filler plate to match card slot size or proximity reader size and car return panel finish, including direction of graining, where card slot or proximity reader cutout is not initially utilized.
4. Elevator control systems shall provide output signal of selected floor to facilitate system tracking of floor access.

2.8 MACHINE ROOM EQUIPMENT

A. Arrange equipment in spaces shown on drawings.

B. Tank:

1. The tank shall be designed and constructed so that when completely filled the factor of safety shall not be less than 4, based on the ultimate strength of material.
2. The tank shall be covered and vented.
3. The tank shall be provided with a means for checking liquid level. Such means shall be accessible without the removal of any covers or other part.

C. Pump Unit:

1. Assembled unit consisting of dry positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping, manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil level gauge, outlet strainer, drip pan, muffler, all mounted on isolating pads.
2. Oil Cooler:
   a. Provide oil cooler with adjustable thermostat.
   b. Installation of unit must be coordinated with Architect to allow ventilation of unit outside of the elevator machine room.
3. Tank Heater: Provide an oil tank heater with adjustable thermostat to keep the oil tank temperature within the manufacturer's recommended operating range.
4. Submersible pump motor shall be permitted up to 50 HP.

D. Landing System: Solid-state, magnetic, or optical type.

E. Controller:

1. Compartment:
   a. UL/CSA labeled.
   b. Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame.
   c. Completely enclose equipment with covers.
   d. Provide means to prevent overheating.
2. Relay Design:
   a. Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear.
   b. Provide wiping action and means to prevent sticking due to fusion.
   c. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
3. Microprocessor Hardware:
   a. Provide built-in noise suppression devices that provide a high level of noise immunity on all solid-state hardware and devices.
   b. Provide power supplies with noise suppression devices.
   c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
   d. Design control circuits with one leg of power supply grounded.

e. Safety circuits shall not be affected by accidental grounding of any part of the system.
f. System shall automatically restart when power is restored.
g. System memory shall be retained in the event of power failure or disturbance.
h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.

4. Wiring:
   a. CSA labeled copper for factory wiring.
   b. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
   c. Provide labels for all extra or spare wires, neatly organized at base of controller cabinet.
5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
6. Provide control panel compliant with UL 508A SB.SCCR of 5000A required.

F. Electrical Wiring and Wiring Connections:
1. Auxiliary Disconnect: Provide controller or machine mounted auxiliary, lockable “open” disconnect.
2. Conductors and Connections:
   a. Copper throughout with individual wires coded and connections on identified studs or terminal blocks.
   b. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes.
3. Conduit:
   a. Galvanized steel conduit, EMT, or duct.
   b. Flexible conduit length not to exceed 3'-0".
4. Traveling Cables:
   a. Tag spares in machine room.
   b. Provide cables from controller to car top.
5. Auxiliary Wiring:
   a. Provide machine room demarcation junction boxes for fire alarm initiating devices, the emergency two-way communication system, firefighters’ phone, CCTV, and card reader interface terminals and relays.
   b. Provide conduit, wiring and connections for the fire alarm initiating devices, emergency two-way communication system, firefighters’ phone, CCTV, security system and card reader interface terminals and relays, from machine room junction box to each car controller in machine room.

G. Muffler: Provide in discharge oil line near pump unit.
1. Design shall dampen and absorb pulsation and noise in the flow of hydraulic fluid.
2. Muffler shall be an air charged or non-baffled design.

H. Piping and Oil:

1. Provide piping, connections and oil for the system.
2. Buried piping shall be secondarily contained with watertight Schedule 40 PVC sleeves between elevator machine room and pit.
3. A minimum of two sound isolation couplings shall be provided between the pump unit and oil line and the oil line and jack unit.
4. Provide 2-90° joints to reduce vibration and create wave diffraction.
5. Provide isolated pipe stands or hangers.

I. Shut-Off Valve: Provide oil line shut off valve in the machine room or accessible from outside the hoistway. Provide second valve in pit adjacent to jack unit.

J. Pressure Switch: Provide oil pressure sensitive switch to automatically close and prevent loss of oil in cylinder upon loss of pressure in oil supply line.

2.9 HOISTWAY EQUIPMENT

A. Guide Rails:
1. Planed steel T-sections for car of suitable size and weight for the application, including seismic reactions, including brackets for attachment to building structure.
2. Provide bracketing, at top and bottom of floor beams.
3. No additional structural points of attachment other than those shown on the Contract Documents will be provided.

B. Sheaves:
1. Machined grooves and sealed bearings.
2. Provide mounting means to top of plungers.

C. Terminal Stopping: Provide normal and final devices.

D. Electrical Wiring and Wiring Connections:
1. Conductors and Connections:
a. Copper throughout with individual wires coded and connections on identified studs or terminal blocks.
b. The use of splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes is prohibited.
c. Provide 20% spare conductors for each wire type.
d. Run spare wires from car connection points to individual elevator controllers in the machine room space.
2. Conduit:
a. Galvanized steel conduit, EMT, or duct.
b. Flexible conduit between isolated equipment, length not to exceed 3'-0".
3. Traveling Cables:
a. Flame and moisture-resistant outer cover.
b. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.

c. Provide the following composition at a minimum, which shall not be considered spares:
   1) Five pair of shielded 20-gauge wire for card reader.
   2) Two pair of shielded 18-gauge wire for CCTV, from car controller to car top junction box, plus 3'-0" excess loop at both ends.
   3) Two pair of 18-gauge wire for CCTV power.
d. Provide eight pair of spare shielded communication wires in addition to those required to connect specified items.
e. Tag spares in machine room/equipment space. Provide cables from controller to car top.
f. Support traveling cable by suspending from supports by means that automatically tighten around the cable when tension is increased.

4. Auxiliary Wiring: Provide conduit, wiring and connections for systems.

E. Entrance Equipment:
1. Two-point hanger roller with non-metallic roller surface and suspension with eccentric upthrust roller adjustment.
2. Bar or formed, cold-drawn removable steel door tracks with smooth roller contact surface.
3. Door Interlocks: Operable door locks without retiring cam.
4. Door Closers:
   a. Spring, spirator, or jamb/strut mounted counterweight type.
   b. Design and adjust to ensure a smooth and quiet mechanical close of doors.

F. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors or hoistway fascia. Must be visible from within car.

2.10 HOISTWAY ENTRANCES

A. Entrance Assemblies:
1. Complete entrances bearing fire labels from a certified testing laboratory approved by authority having jurisdiction.
2. Provide entrance assemblies bearing 1½-hour UL label.
3. Paint all exposed metal ferrous metal black.

B. Frames:
1. 14-gauge hollow metal at all floors.
2. Bolted and lapped head to jamb assembly at all floors.
3. Provide Arabic floor designation/tactile marking plates:
   a. Centered at 60" above finished floor.
   b. Located on both side jambs of all entrances.
   c. Minimum 4" high.
   d. Tactile marking indications shall be below Arabic floor designation.
   e. Permanently fastened.

4. Provide car identification label:
    a. Mounted directly below floor designation/Tactile marking plates.
    b. Located on both side jambs at the following levels:
        1) Designated Level.
        2) Alternate Level.
        3) Level where means necessary for tests is provided.
    c. Finish and design to match floor designation/tactile marking plates.
    d. Permanently fastened.
5. Provide plates at main egress landing with “Star” designation.
6. For designated emergency car, provide “Star of Life” designation plates at height of 78"-84" above finished floor on both side jambs at all floors.

C. Door Panels:
1. 16-gauge steel, sandwich construction without binder angles.
2. Provide one leading edge of doors with rubber astragals.
3. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel.
4. Provide one separate 4" steel reinforcement safety gib mounted between door gibs, where not integrated with door gibs.
5. Construct door panels with interlocking, stiffening ribs.

D. Sight Guards:
1. 14-gauge, same material, finish, and height as hoistway entrance door panels.
2. Construct without sharp edges.

E. Sills: Extruded aluminum.

F. Sill Supports:
1. Structural or formed steel designed to support door sill based upon car loading classification.
2. Design to eliminate need for grout under the sill.

G. Fascia, Platform Guards and Hanger Covers:
1. 14-gauge furniture steel with Contractor’s standard finish.
2. Provide full height fascia, platform guards, and hanger covers where rear entrances are not provided.
3. Provide hoistway width fascia, platform guards, and hanger covers for Car 1.

H. Struts and Headers:
1. Provide all support of entrances and related material to building structure. No intermediate support provided.
2. Provide door open bumpers on entrances equipped with vertical struts.

I. Finish of Frames and Doors:
1. Satin finish stainless steel.

2. Provide final painting requirements to General Contractor where factory prime finish is specified.

J. Hoistway Access:

1. Hoistway Door Unlocking Device: Provide unlocking device with locking escutcheon in door panel at all floors, with finish to match adjacent surface.
2. Hoistway Access Switches: Mount in entrance frame side jamb at top floor.
3. Provide switch with faceplate.

2.11 PIT EQUIPMENT

A. Buffers: Provide spring type with blocking and support channels.

B. Hydraulic Jack Assembly:

1. Cylinders:
   a. Seamless steel pipe.
   b. Design head to receive unit-type packing and provide means to collect oil at cylinder head and return automatically to oil reservoir.
   c. Provide secondary containment/cylinder protection.
   d. Provide head assembly access ladders and platforms.
   e. Provide cylinder stabilizer bracketing between guide rails as required.
2. Plungers:
   a. Polished seamless steel tubing or pipe.
   b. If plunger length exceeds 24'-0", provide two or more sections not exceeding 16'-0" in length, or coordinate installation of longer unit at the jobsite.
   c. Join sections by internal threaded couplings.
   d. Multiple section jack units shall be factory polished while assembled and marked.
   e. Isolate plunger from car frames.
3. Provide dual jack holeless application.

C. Jack Support and Fluid Shut-Off Valves:

1. Provide steel pit channels to support jack assembly and transmit loads to building structure.
2. Provide intermediate stabilizers as required.
3. Provide manual on/off valves in oil lines adjacent to pump unit and jack units in pit.

D. Plunger Gripper:

1. Provide mechanical device to apply external pressure symmetrically around the circumference of the plunger.
2. Device shall be capable of stopping and holding the car with its rated load.
3. Actuate device by electrical means upon loss of hydraulic pressure.

E. Overspeed Valves:

1. Provide a pressure sensitive, mechanically actuated, seismic safety valve.
2. Connect valve directly to jack assembly inlet.

F. Scavenger Pump: Provide electrically operated scavenger pump to collect oil at cylinder head and return directly to oil reservoir in elevator machine room.

G. Refuge Space: Identify and clearly mark refuge space in the pit.

H. Pit Access:

1. Hoistway Access Key Switch:
   a. Provide key switch at lowest terminal landing.
   b. Mount in entrance frame side jamb.
   c. Provide switch with faceplate.
2. Provide pit stop switch(es).
3. Provide pit access door switch configured to effectively remove power from elevators in the event of pit access door operation.

I. Equipment Access:

1. Stencil car number on buffer.

2.12 CAR EQUIPMENT

A. Frame: Welded or bolted rolled or formed steel channel construction to meet load classification specified.

B. Safety Device: Type “A,” instantaneous wedge clamp.

C. Platform:

1. Design and construct to accommodate load classification requirements.
   a. Passenger Elevator: Provide Class “A” construction.
   b. Provide recess to accommodate a minimum 2” floor thickness.
2. The car platform shall consist of a steel frame with necessary steel stringers, all securely welded together.
3. Provide platform with two layers of 3/4" marine grade plywood.
4. Cover the underside of the car platform with sheet steel.
5. Isolate the passenger elevator platform. The support frame shall include rubber pads on which the platform shall rest without any connection to the steel frame.
6. Work Light Fixtures and AC Receptacles: Provide permanent mounted work light fixtures below platform, complete with proper lamp guards.

D. Platform Guard: Minimum 48" high, 14-gauge steel, reinforced and braced to car platform front with Manufacturer’s standard finish.

E. Cartop Guard Rail: Provide a railing system provided on the outside perimeter of the car top on all sides where the horizontal distance between the edges of the car top and the adjacent hoistway enclosure exceeds 12".

F. Passenger Guides: Roller type with three or more spring-dampened sound-deadening rollers per shoe. Minimum 3"outside diameter. Solid guides with oilless.

G. Cab Steadying Plates:

1. Provide and install top of car steadying plates.

2. Emphasis shall be placed on proper tension to car styles allowing minimal lateral movement of the cab.
3. Steadying plates shall be isolated using rubber or non-metallic guides or rollers.

H. Sills:
1. One-piece extrusion with extension between car entrance columns to face of car front return.
2. Extruded extension to match finish of sill.
3. Elevator 1: Aluminum.

I. Door Panels:
1. 16-gauge steel, sandwich construction without binder angles.
2. Provide one leading edge of doors with rubber astragals.
3. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel.
4. Construct door panels with interlocking, stiffening ribs.

J. Door Hangers:
1. Two-point suspension.
2. Hanger roller with non-metallic surface and eccentric roller adjustment.

K. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.

L. Door Header: Construct of minimum 12-gauge steel, shape to provide stiffening flanges.

M. Door Electrical Contact: Prohibit car operation unless car door is closed.

N. Door Clutch: Heavy-duty clutch, linkage arms, vane assembly and pickup rollers or cams to provide positive, smooth, quiet door operation.

O. Restricted Opening Device: Provide mechanical car-door restrictor to prevent opening of doors when outside unlocking zone.

P. Door Operator:
1. High speed, heavy-duty door operator capable of opening doors at no less than 1.5 fps
2. Accomplish reversal within 2½" of door movement.
3. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current.
4. Provide a minimum of four controller-based motion profiles, per floor, per door, to maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.

Q. Car Operating Panel:
1. Passenger:
a. One car operating panels with faceplates:

1) Consisting of a metal box containing vandal resistant operating fixtures, mounted behind the car stationary front return panel.
2) Faceplates shall be hinged and constructed of satin finish stainless steel.

b. Suitably identify floor buttons, alarm button, door open button, door close button and emergency push-to-call button with cast stainless tactile symbols rear mounted.

c. Provide “door open” button to stop and reopen doors or hold doors in open position.

d. Provide “door close” button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters’ operation.

e. Pushbuttons:
1) Provide minimum 3/4" diameter raised floor pushbuttons which illuminate to indicate call registration.
2) Provide brushed stainless-steel buttons with illuminated LED halo.
3) Include 5/8" high floor designation on face of pushbutton.

f. Locate operating controls no higher than 48" above the car floor; no lower than 35" for emergency push-to-call button and alarm button.

g. Locked Firefighters Operation Panel:
1) For fire officer use and independent service only.
2) Openable by the same key which operates the Fire Operation switch.
3) Panel shall be provided with solenoid operated key switch which automatically opens in the event of Firefighters’ Phase I activation.
4) Including the following features:
a) Phase II fire access switch.
b) Firefighters’ visual indication.
c) Call cancel button.
d) Stop switch, manually operated.
e) Door open button.
f) Door close button.
g) Floors served.
h) Fire communication jack.

2. Service Compartment:
a. Provide lockable service compartment with recessed flush door.
b. Door material and finish shall match car return panel or car operating panel faceplate.
c. Inside surface of door shall contain an integral flush window for displaying the elevator operating permit.
d. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
1) Access switch.
2) Light switch.

3) Exhaust blower switch.
4) Independent service switch.
5) Constant pressure test button for battery pack emergency lighting.
6) 120-volt, AC, GFCI protected electrical convenience duplex outlet.
7) Card reader override switch.
8) Switch to select either floor voice annunciation, floor passing tone, or chime.
9) Attendant operation switch.
10) Keyed stop switch.

3. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
   a. Phase II firefighters' operating instructions on inside face of firefighters' compartment door.
   b. Engrave filled red firefighters' operation on outside face of compartment door.
   c. Building identification car number on main car operating panel.
   d. "No Smoking" on main car operating panel.
   e. Car capacity in pounds on main car operating panel.

R. Car Top Control Station:
   1. Mount to provide safe access and utilization while standing on car top.
   2. Operating device shall contain Up and Down direction buttons, a Run button, an Inspection/Automatic switch and Emergency Stop switch.
   3. Operating device shall contain an audible and visible indicator that fire recall has been initiated.
   4. This station shall be fixed to the car crosshead or may be portable provided the extension cord and housing is permanently attached to the car crosshead.
   5. The car will be operated by constant pressure on the appropriate directional button and the Run button simultaneously.
   6. Normal operating devices will be inoperative while this device is in use.

S. Emergency Audible Signaling:
   1. Provide on top of each elevator.
   2. Activation of Alarm Button or Emergency Stop switch will initiate Emergency Audible Signal.
   3. Provide auxiliary power supply to provide 1-hour power in the event of normal power loss.

T. Work Light and Duplex Plug Receptacle:
   1. GFCI protected outlet at top and bottom of car.
   2. Include on/off switch and lamp guard.
   3. Provide additional GFCI protected outlet on car top for installation of car CCTV.

2.13 CAR ENCLOSURE

A. Passenger Elevator: Provide complete as specified herein.

1. Shell:
   a. Reinforced 14-gauge furniture steel formed panels with baked enamel interior finish as selected.
   b. Apply sound-deadening mastic to exterior.
   c. Provide concealed ventilation cutouts.
2. Canopy:
   a. Reinforced 12-gauge furniture steel formed panels with lockable, contacted, hinged emergency exit.
   b. Interior finish white color reflective baked enamel.
3. Front Swing Return Panels and Integral Entrance Columns:
   a. Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin stainless steel.
   b. Swing entire unit on substantial pivot points (minimum three) for service access to car operating panels.
   c. Locate pivot points to provide full swing of return panel without interference with side wall finish or handrail.
   d. Secure in closed position with concealed three-point latch.
   e. Provide firefighters' and service compartments with recessed flush cover and cutouts for operating switches, etc.
4. Front Stationary Return Panels: Reinforced 14-gauge furniture satin stainless steel with minimum 16-gauge with cutouts for applied car operating panels and other equipment.
5. Transom: Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin stainless steel full width of enclosure with cutout for car position indicator.
6. Base: Stainless steel with concealed ventilation cutouts.
7. Finish Floor Covering:
   a. Furnished under other sections.
8. Interior Wall Finish:
   a. Removable panels faced and edged, with color core plastic laminate, color and finish as selected.
   b. Removable panels, faced and edged, with satin stainless-steel pattern.
9. Ventilation:
   a. Forced ventilation.
   b. Three-speed fan or blower mounted to car canopy.
   c. Exhaust blower shall meet noise and vibration criteria.
10. Lighting:
    a. Provide LED fixtures with wiring and hookup.
    b. Coordinate with emergency lighting requirements.
11. Suspended Ceiling:

a. Six-section satin finish stainless steel panels with lighting cutouts in each panel.

12. Handrails:
    a. Minimum 1¼" diameter stainless steel tubular grab bar with backing plates and captive nuts across rear wall.
    b. Provide at 32" above finished floor, as indicated on Architectural drawings.
    c. Return handrail/guardrail ends to car walls.
13. Pads and Buttons, Elevator 1:
    a. Three-piece removable pads.
    b. Two pads covering side walls and adjacent front returns and one covering rear wall.
    c. Provide cutouts to access main car operating panel.

2.14 HALL CONTROL STATIONS

A. Pushbuttons:
    1. Provide one pushbutton riser.
    2. Provide flush mounted faceplates.
    3. Include pushbuttons for each direction of travel that illuminate to indicate call registration.
    4. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency as part of faceplate.
    5. Pushbutton design shall match car operating panel pushbuttons.
    6. Provide vandal resistant light assemblies.
    7. Provide LED illumination.
    8. Provide Phase I Fire Service key switch, engraved operating instructions and illuminating jewel.
    9. Provide communication check failure indication and silence key switch.
    10. Incorporate all items required by Code at the primary egress level into a single hall fixture.

B. Phase I Fire Service Fixture: Provide separate fixture including key switch, engraved operating instructions, and illuminating jewel.

2.15 SIGNALS

A. Hall Direction Lantern, Elevator 1:
    1. Provide at each entrance to indicate travel direction of arriving car.
    2. Illuminate up or down LED lights and sound tone once for up and twice for down direction prior to car arrival at floor.
    3. Illuminate light until the car doors start to close.
    4. Sound level shall be adjustable from 20-80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor.

5. Provide advanced hall lantern notification to comply with ADA hall call notification time.
6. Provide adjustable car door dwell time to comply with ADA requirements relative to hall call notification time.
7. Hall direction lenses shall be arrow shaped with faceplates.
8. Lenses shall be minimum 2½" in their smallest dimension.

B. Car Position Indicator:
1. Alpha-numeric digital indicator LCD screens containing floor designations and direction arrows a minimum of 2" high to indicate floor served and direction of car travel.
2. Locate fixture in car front return panel above car operating panel.
3. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway.
4. Illuminate proper direction arrow to indicate direction of travel.
5. Provide multi-numeral vandal resistant indicator and light assemblies.

C. Fixture Faceplate Material and Finish:
1. Satin stainless steel, all fixtures.
2. Tamper resistant fasteners for all public facing fastenings.

D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.

E. Voice Synthesizer: Provide electronic device with easily reprogrammable message and female voice to announce car direction, floor, emergency exiting instructions, etc.

2.16 COMMUNICATION

A. Car Communication System:
1. Hands-Free Phone System:
a. Two-way communication instrument in car with automatic dialing, tracking, and recall features, with shielded wiring to car controller in machine room.
b. Provide dialer with automatic rollover capability with minimum two numbers:
1) Actuate two-way communication via “Help” button.
2) Button or adjacent light jewel shall illuminate and flash when call is acknowledged.
3) Button shall match car operating panel pushbutton design.
4) Provide “Help” button tactile symbol, engraved signage, and Tactile marking adjacent to button mounted integral with car front return panel.
2. Emergency Personnel Communication:
a. Communication system shall be provided allowing emergency personnel to establish communications with each elevator individually.
b. Emergency Personnel Communication shall override any existing connection outside of building.
c. Adjacent light jewel shall illuminate and flash when call is acknowledged.

d. Provide operating instructions.

e. On the same car operating panel as the phone push button, provide capability to communicate with and obtain responses from passengers.

f. Provide display video capability for entrapment assessment.

3. Communication for Deaf, Hard of Hearing, and Nonverbal: On the same car operating panel as the phone pushbutton, provide capability to communicate visually with and obtain responses from passengers, including those passengers who cannot communicate verbally or hear.

4. Intercom System:

a. General:

1) Provide intercommunication system complete with talkback speaker, required auxiliary equipment and wiring.

2) Include a preamplifier and associated equipment required to receive input from building.

3) A battery backup system shall be provided for the two-way conversation system. The battery backup system shall be capable of providing power for a minimum of four hours.

4) If it is determined that there will not be a 24-hour manned station on the premises, then the system provided shall be capable of dialing out of the facility to a 24-hour manned answering service, or must be of the automatic dialing system and not an intercommunication system.

5) In locations that call for Master Stations, a phone with a dedicated line shall be provided (by others).

b. Master Stations:

1) Concierge Desk/Fire Control Station: Arrange to communicate with any other station, any group of stations or all stations simultaneously; include following devices:

a) Combination speaker-microphone.

b) Selector buttons for each station in system.

c) A button for simultaneous conversation with all stations in system.

d) Talk-listen button; press to talk, release to listen.

e) IN USE light to indicate when any master station is in use.

f) Reset Button; to disconnect call, extinguish in use light, and reset selection buttons to free system for next call.

g) Volume control.

2) Machine Room/Control Rooms:

a) Arrange to communicate with other master stations and all elevator cars.

b) In addition to devices specified for Fire Control Station, provide a loud audible signal to announce calls to this unit.

B. Firefighters' Key Box:

1. Flush-mounted box with lockable hinged cover.

2. Engrave instructions for use on cover per Local Fire Authority requirements.

C. Machine Room Monitoring and Display System with Battery Backup:

1. Provide elevator with a monitoring system in the machine room with color monitor.
2. System shall be a Windows based operating system capable of outputting to external media. As a minimum, system shall display the following functions:
   a. Car operating in normal/standby power.
   b. Car position and direction of travel.
   c. Car and hall calls.
   d. Operating mode.
   e. Door status.
   f. Delayed car.
   g. Load weighing and by-pass.
   h. Car to lobby feature.
   i. Car in/out of service.
   j. Firefighters' operation.
   k. Card reader override.
   l. Individual car on/off provisions.
3. System Performance Monitoring:
   a. Hall call registration information:
      1) Provide memory capacity for at least the preceding five, 24-hour periods, in blocks of 5- or 15-minute segments, running hour to hour (i.e., 2:00 p.m. to 3:00 p.m.).
      2) Visual and printed summary of hall call registration events by floor, direction, and duration, totaled in 5- or 15-minute segments during any 60-minute block using an internal clock.
      3) Visual and printed summary of hall call registration duration averaged for 5- or 15-minute and hourly periods.
      4) Visual and printed summary of percentage of hall calls answered within 30 and 60 seconds in each 5- or 15-minute and hourly periods.
      5) Visual and printed summary of time periods during which individual cars are not in group operation (operating separately or out of service).
   b. Accumulate system fault data including nature of fault, time, and day.
   c. Store and retrieval capabilities for minimum 30-day period.
4. Provide printer to produce a hard copy of stored data.
5. Provide directions and software to accomplish information retrieval.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation of equipment examine hoistway and machine room areas.

B. Verify no irregularities exist which affect execution of work specified.

C. Verify electrical power location and characteristics in coordination with equipment requirements.

D. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

B. Install machine room equipment with clearances in accordance with referenced codes and specification.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Provide any required hoisting/safety beams.

F. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

G. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.

1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
2. Machine room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

H. Fill hoistway door frames, back boxes for hallway stations and signal devices, and sills.

I. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test:

1. Load one elevator, capacity, speed, and travel distance to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next.
2. Record temperature rise of elevator machine during 30-minute test period.
3. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

D. Independent Testing by Owner's Consultant.

3.4 CONSTRUCTION TOLERANCES

A. Install rails plumb and align vertically with tolerance of 1/16" in 100'-0".

B. Secure joints without gaps and file any irregularities to a smooth surface.

3.5 ADJUSTING

A. Install hydraulic jack assembly and guide rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure piston joints without gaps and file any irregularities to a smooth surface.

B. Static balance car to equalize pressure of guide shoes on guide rails.

C. Lubricate all equipment in accordance with Contractor's instructions.

D. Adjust motors, valves, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

3.6 CLEANING

A. Keep work areas orderly and free from debris during progress of project.

B. Remove packaging materials on a daily basis.

C. Remove all loose materials and filings resulting from work.

D. Clean machine room equipment and floor.

E. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.

F. Clean pit equipment and floor.

3.7 DEMONSTRATION:

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate all aspects of elevators while in normal operation.

B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period.

C. Determine that operation systems and devices are functioning properly.

3.8 PROTECTION

A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed

and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage Elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items which cannot be refinished in the field to the shop, make required repairs, and refinish entire unit, or provide new units as required.

END OF SECTION

DIVISION 21

FIRE SUPRESSION

SECTION 21 13 13

FIRE-SUPPRESSION SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire sprinkler system for protection of buildings.

B. Related Requirements: The requirements of this Section, NFPA 13 shall take precedence over requirements found in the following:
   1. Division 01 - General Requirements.
   2. Section 07 8413: Penetration Fireproofing.

1.2 SUBMITTALS

A. Manufacturer’s Data:
   1. Submit a complete and detailed equipment and material list of items to be furnished and installed under this section.
   2. Submit the manufacturer's specifications and other data required to demonstrate compliance with the plans and specified requirements.

B. Drawings:
   1. Submit shop drawings of wet pipe fire protection sprinkler systems in compliance with NFPA 13, Standard for the Installation of Sprinkler Systems, Sprinkler systems shall comply with the provisions of NFPA 13.
   2. Shop drawings shall fully comply with the most stringent provisions of this specification and plans, and with the applicable codes and standards.
   3. Shop drawings shall be the same size as the Contract Drawings and shall be produced using AutoCAD.

C. Regulatory Requirements:
   1. Installation of the fire sprinkler system shall not vary from the plans unless alterations have been approved by the State Fire Marshal.
   2. Complete DSA standard testing forms and get sign-off by the Project Inspector.

D. Closeout Submittals: Submit in accordance with Section 01 7700, Contract Closeout, and as specified herein:
   1. Record Drawings:

a. Record drawings of installed Work shall be maintained current on the Project site, available for the Fire Marshal and the Project Inspector to review.
b. At the completion of installation submit Record Drawings signed by the installing Contractor in AutoCAD format, including:
   1) Record Specifications.
   2) Record Product Data: Include specific model, type, and size for equipment and material installed.
   3) Record Test Results.
   4) Maintenance Manuals.

1.3 QUALITY ASSURANCE

A. Comply with applicable national or local codes and standards.

B. Except where exceeded by the requirements of these specifications, the following are made part of this section: prints and details, and provisions of the NFPA 13 Standard for Installation of Sprinkler Systems.

C. Qualifications of Manufacturer: Products used in work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a 5 year history of successful production that is acceptable to the Architect.

D. Qualifications of Installer: The Installer shall have a current C-16 license in the State of California in the installation of fire sprinkler systems.

1.4 FIRE SERVICE WATER CONNECTION

A. The Owner shall pay fees and provide for the fire main POC (point of connection), consisting of the installation of a single detector check valve (if one is required) and meter shut-off valve inside a meter vault.

B. Fire Service Mains shall be provided with approved Meter Service Backflow protection. An approved Reduced Pressure Principle Backflow Prevention Assembly (RP) to meet minimum backflow protection requirements for meter service protection (MSP) shall be provided on the fire main, according to the California Plumbing Code (CPC) and according to the current Los Angeles County where applicable (see section 2.02.D for backflow assemblies). Double Check Assemblies shall only be used with the written approval of the Water Purveyor.

1.5 COORDINATION

A. Coordinate activities in accordance with provisions of Section 22 0500.

1.6 JOB CONDITIONS

A. Unscheduled utility flow interruptions are not permitted. Schedule service interruptions in advance, with the OAR.

1.7 EXTRA MATERIALS FOR MAINTENANCE

A. Provide spare sprinkler heads in a quantity equal to 2 percent of the total number of each type of sprinkler head installed. There shall be no less than two heads of each type and temperature rating provided and in no case less than six spare sprinkler heads per building. There shall be no fewer than 6 spare sprinkler heads for up to 300 sprinkler heads installed; no less than 12 spare sprinkler heads for up to 1,000 sprinkler heads installed; and no less than 24 spare sprinkler heads for the sites with more than 1,000 sprinkler heads installed. Spare sprinkler heads shall be kept inside of spare sprinkler head box(s). A spare sprinkler wrench for each type of sprinkler head shall also be provided inside of each spare sprinkler head box, at each building. Locations of spare sprinkler boxes shall be located at:

1. Fire Sprinkler Riser, when enclosed and secure.
2. Plant Manager's Office, when the Fire Sprinkler Riser is exposed.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEM DESCRIPTION

A. General: Provide systems complete including, but not limited to:

1. Provide underground and above ground sprinkler and standpipe piping including trenching and backfilling. Materials and equipment shall be UL/FM listed and approved as required by NFPA for their application. Required signage shall be provided and installed as required by NFPA 13.
2. Provide overhead sprinkler system with sprinklers installed as required according to type, location and temperature rating.

B. Sprinkler Heads:

1. Provide chrome pendant spray type sprinkler heads with matching escutcheons in areas with finished ceilings. Exterior escutcheons shall be poly-coated or concealed type to prevent rusting and oxidation.
2. Provide upright sprinklers in areas with exposed piping.
3. Provide poly-coated glass bulb corrosion resistance type sprinklers heads in areas exposed to a corrosive environment such as parking garages and coastal air.
4. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation,

5. Sprinklers in concealed spaces, exterior locations, and other areas that will experience over 100 degrees F ambient temperature shall be furnished with 200 to 225 degree rated sprinklers. Sprinkler heads in boiler rooms, furnace rooms, or heater rooms shall be furnished with sprinklers rated at 250 to 290 degrees F. If a sprinkler is directly affected by a spotlight, steam, or other heat source, a 350 degree F or higher sprinkler head shall be furnished. Sprinkler heads in other locations, unless otherwise noted, shall be 155 to 165 degrees F rated.
6. Automatic fire sprinkler head type shall be as follows:
   a. In areas with ceiling heights of nine-feet or lower, sprinkler heads installed shall be recessed or fully concealed.
   b. Ceilings eight-feet or lower shall be provided with fully concealed sprinkler heads.
   c. Areas with ceiling height of nine-feet or lower, that are not constantly supervised such as corridors, arcades, students restrooms, and other restrooms shall be provided with fully concealed sprinkler heads.
7. Sprinkler heads in light hazard occupancies are required to be Quick Response sprinklers as required in NFPA 13. Sprinkler heads shall be of the same manufacturer throughout the building/site as indicated. Sprinklers shall typically be ½ inches NPT, standard orifice, minimum 5.6 nominal K factor, UL listed for 175 psi, and listed for light and ordinary hazard occupancies.
8. Other specialized sprinkler heads such as walk-in refrigerator or freezer heads, side wall, ¾ inches sprinklers above 5.6 K factor, and those sprinklers with a K factor below 5.6, shall only be used where required by project condition. Large drop sprinkler heads and extended coverage sprinkler heads shall not be installed.
9. Sprinkler head location shall be designed and installed in an aesthetically pleasing manner and should generally be located in center of 24-inch by 24-inch ceiling tiles and in center of 24-inch by 48-inch ceiling tiles in the 24-inch direction and no closer than 12-inch from the edge in the 48-inch direction.
10. UL/FM listed Sprinkler head guards shall be provided on Sprinkler heads installed at seven feet six inches above floor or lower in exposed locations, or that are deemed subject to damage. Sprinkler head guards shall securely fasten with bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at seven feet six-inch heights or lower.

C. Fire Sprinkler Systems:
   1. Underground piping: Comply with the requirements of Section 33 1100, Site Water Distribution Utilities.
   2. Provide an underground UL/FM listed PVC or Ductile iron supply line connected to detector check meter or water main as indicated. Install site water mains no closer than 10’- 0” parallel to the building

foundations. Underground fire water lines shall be installed 36 inches below grade. Tracer wire shall be installed in accordance with Section 33 1100: Site Water Distribution Utilities.

3. Fire Department Connection (FDC) with check valve (wafer type) shall be provided after the backflow preventor, and before the building fire sprinkler riser(s), located where the FDC will be accessible to the fire department from the street or sidewalk without obstructions. No shut off valve shall be allowed on the FDC line as per NFPA 13. FDCs shall have a height between two and four-foot above the ground.
4. PIVs shall be electrically supervised regardless the number of fire sprinkler served (CBC 903.4), and set at a height of three feet to the top and have the handle locked in place with a break-a-way lock.
5. Provide a UL listed, FM approved FDC, approved RP type backflow assembly, check valves, shut-off valves, drain valves, ITV, and flow indicator at the locations required. (Test-and-drain combination valves are prohibited.)
6. Flow indicator shall activate the fire alarm system between 45 and 90 seconds, and activate a local alarm on the outside of the building continuously with water flow. Connection of this switch is a part of the Work of Division 26. Shut-off including valves on the fire main backflow preventor shall be electrically supervised according to CBC 903.4,, NFPA 13 and Section 28 3100 – “Fire Detection and Alarm”.
7. Pipe through ceilings at head locations shall be furnished with a two piece, or fully concealed escutcheon. Unless otherwise designated, escutcheons shall be identical and match the other escutcheons of the same type throughout the building or site. Piping through walls and ceilings shall have a split ring chrome escutcheon.
   a. Flexible stainless steel sprinkler head drop system may be used. Flexible drops shall be UL listed, FM approved, and shall be compatible with ceiling systems. Flexible drop length shall be included in the Hydraulic Calculations. The drop system shall include the required support bracing.
8. Furnish and install required signs, spare heads, special wrenches, and spare sprinkler head boxes as required to satisfy NFPA 13 specification.
9. Sprinkler system piping shall be provided with complete drainage as required by NFPA. Test valve discharge shall be piped away from planters to asphalt areas. Furnish protection of piping against accidental or malicious damage.
10. Upon completion of the Work of this section, and before Substantial Completion, subject system, including underground supply connection, to tests required. A minimum hydrostatic test shall be two hundred pounds (200 psi) or fifty pounds (50 psi) in excess of the maximum system working pressure, whichever is greater, for two hours with no leaks or loss of pressure per NFPA 13. The Project Inspector shall be furnished with a NFPA 13 test certification.
11. Local fire sprinkler alarm requirements shall be accomplished with a vane or paddle type water flow detector switch and an electrically

powered fire sprinkler horn located on the street side of the building and connected to the fire alarm control panel with secondary power provided from the fire alarm batteries. The drilled out disk shall be attached to the mounting U-bolt. Time delay shall be set at 45 to 60 seconds. Mechanically activated water bells with alarm valve and pressure switch are prohibited.

12. Seismic separation assemblies shall be located between the buildings if space allows accessibility. Otherwise they shall be located inside the building providing the most space. Swing joints may be fabricated on site using flexible groove couplings and six grooved (Victaulic) 90 degree elbows in a teepee formation (see NFPA 13, figure A.9.3.3). Seismic separation assemblies can also be made utilizing a manufactured, UL/FM listed swing joint assembly rated at a minimum 175 psi.
13. Hanging, bracing and support shall utilize only UL/FM listed approved products, and comply with NFPA 13, Chapter 9 requirements for rod and bolt sizes except for the following: 4 and 6 inch pipe shall be supported by a minimum ½ inch hanger rod, 8 inch pipe shall be supported by a minimum 5/8 inch hanger rod, 10 and 12 inch pipe shall be supported by a minimum ¾ inch hanger rod. Hanger rods in exterior locations and in parking structures shall have Electrodeposited Zinc Coating per ASTM B633 to prevent rusting.
14. Building Fire Sprinkler riser assemblies shall be provided as follows. Every building shall be provided with an accessible and electrically supervised riser shut off valve at a height not to exceed five-feet above the floor. Every building riser assembly shall be equipped with a check valve followed by a main drain valve and then the flow indicating switch and pressure gauge immediately after the shut-off valve. In cases where a riser assembly is provided for each floor in the building, a check valve, main drain and flow switch shall be provided for each floor; the main building shut-off shall not be required. An electrically supervised Post Indicator Valve located outside the building may serve as the building riser shut-off valve.

2.2 MATERIALS

A. Access Panel:

FAP-1 Square, steel, prime-coated, with vandal-proof door lock operated by Allen wrench:

Smith	Josam	Elmdor	Or equal
4760		DW – AKL	

B. Globe or Angle Valves: UL/FM listed.

AV-1 Bronze angle valve: 2 inches and smaller, screwed-in bonnet, threaded ends, rising stem:

Nibco	Kennedy	Fairbanks	United	Or equal
T-301	98 SD	0210	126T	

C. Automatic Fire Sprinkler Head, UL/FM listed:

AFSH-1 Brass pendant type for areas with suspended ceilings:

Victaulic	Tyco	Viking	Reliable	Or equal
V27	TY 3231	VK302	F1FR56	

AFSH-2 Brass upright type for areas with no ceilings:

Victaulic	Tyco	Viking	Reliable	Or equal
V27	TY3131	VK300	F1FR300	

AFSH-3 Chrome or poly coated semi recessed type with semi-recessed escutcheon:

Victaulic	Tyco	Viking	Reliable	Or equal
V27	TY3231	VK302	F1FR56	

AFSH-4 Fully concealed type sprinklers; chrome cover:

Victaulic	Tyco	Viking	Reliable	Or equal
V38	TY3531	VK462	F4FR	
		VK404	G4A	

D. Backflow Prevention Assemblies:

BPV-1 Reduced Pressure Principle Backflow Prevention Assembly (RP) type for meter service protection (MSP) requirements:

Ames	Febco	Watts	Wilkins	Or equal
4000SS	860 OS&Y	909 RP	975 RP	
C400	880 OS&Y	957 RP	375 RP	
M400		994 RP		

BPV-2 Reduced Pressure Principle Detector Assembly (RPDA) for MSP requirements:

Ames	Febco	Watts	Wilkins	Or equal
5000SS	860 DA	909 RPDA	950 DA	
C500	880 DA	957 RPDA	350 DA	
M500		994 RPDA		

E. Gear Operated Butterfly Valves:

GOBFV-1 Grooved end Gear Operated Butterfly Valve, 300 psi, for fire protection sprinkler risers. UL listed, FM approved, with weatherproof gearbox and double pole/double throw monitor switch, double seal design for bubble tight shut off at 175 psi.

Corrosion-resistant, fusion-bonded nylon II body coating, easy to read position indicator:

Kennedy Figure 82M	Nibco GD-4765-8N, 300 psi	Victaulic 705W 300 psi	Tyco 580 300 psi	Or equal

GOBFV-2 Wafer Type Gear Operated. Butterfly Valve, same requirements as GOBFV-1:

Kennedy Figure 82W	Nibco WD-3510 300 psi	Or Equal

F. Check Valves:

CV-1 Bronze check valves: 2 inches and smaller, 200 psi WOG, bronze disc, swing type, conforming to MSS-SP-80-97, threaded ends:

Crane 37	Nibco T-433-Y	Stockham B-319	United 62T	Or Equal

CV-2 Iron check valves: 2-1/2 inches and larger, class 175, composition disc, swing type, bolted cap, UL listed, FM approved flanged ends:

Stockham G-940	Kennedy 126	Tyco Model G	Clow F5380	Or Equal

CV-3 Wafer Type Check Valve:

United Wafer Check #90	Nibco KW-900-W	Mueller A-2102

Or equal.

CV-4 Grooved Check valve 2 ½ inch and larger:

United 67	Gruvlock Tyco 7800 590F	Reliable Mode “G”	Victaulic Series	717

Or equal.

G. Escutcheons

ES-1 Chrome plated, or white poly-coated, 2-piece canopy (escutcheon), 2.25 to 3.5 inches in extended position:

FPPI	Tyco	Reliable	Or equal

01 - 401 Chrome or White	No. 401 Chrome or White	HBC (chrome) HBW (white)

ES-2 Chrome plated or white poly coated, 2-piece recessed:

FPPI	Tyco	Reliable (semi recessed)	Or equal
01 - 400	410	GF2-C (chrome)	
01 - 402	420	GF2-W (white)	

H. Fire Department Connections:

FDC-1 UL listed, FM approved, type, 4 inch by 2-1/2 inches by 2-1/2 inches bronze body fire department hose connection (FDC):

Crocker	Potter-Roemer	Tyco	Powhaten	Or equal
6405 or 6420	5710 or 5730	86	21-201 or 31-133	

I. Flow Indicators:

FIA-1 Listed by State Fire Marshal, with double pole, double-throw switch, one normally open and one normally closed, UL listed and FM approved:

Potter-Roemer VSRF Series	Notifier WFR Series	Or equal

J. Outside Stem and Yoke Gate Valves:

OS&Y-1 Bronze Gate Valves: 2 inches and smaller, class 175, solid bronze wedge disc, OS&Y, copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham	Crane		Nibco
	United	Or equal	
B-133	459	T-14	18

OS&Y-2 Iron gate valves: 2 ½-inch and larger, class 175, IBBM, OS&Y, solid wedge disc, Teflon-impregnated packing, UL/FM listed, flanged ends:

Stockham	Crane	Kennedy	Mueller	Victaulic
G-634	467	68	A-2073	771
Or equal.				

OS&Y-3 2 ½-inch and larger, epoxy coated, resilient wedge, 175 pounds gate valve for riser valves, P.I.V., and shut off:

Clow F-6136	Nibco 617-0	Kennedy KV-4068	Mueller A-2360	Or equal

K. Gate Valves:

GV-1 Bronze gate valves: 2-inch and smaller, class 175, solid bronze wedge disc, rising stem copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham B-133	Crane 459	Grinnell Fig. 66 14	United	Or equal

GV-2 Iron gate valves: 2 ½-inch and larger, class 175, IBBM, solid wedge disc, Teflon impregnated packing, UL/FM listed, flanged ends:

Stockham G-634	Crane 467	Kennedy 68	Mueller A-2052	Victaulic 772

Or equal.

L. Gear Operated Ball Valves:

GOBV-1 Threaded ball valve for sizes two inches and smaller:

Nibco KT-505W-4 Victaulic 728 Or equal.

M. Seismic Swing Joints:

SJ-1 UL/FM Approved flexible seismic connector with grooved, or threaded ends for seismic separation requirements.

SJ-2 Fabricated swing joints as per NFPA 13 using six groove 90 degree elbows and flexible groove couplers such as Victaulic style 75.

N. Post Indicator Valves:

PIV-1 Vertical Indicator Posts: Furnished for underground valves, post must provide a means of knowing if the valve is open or shut, UL/FM listed. (Where a backflow assembly is provided, the shutoff valves on the backflow preventer satisfy the requirement for a post indicator valve to control the fire main and FD Connection):

Stockham G-951	Kennedy 2945	Grinnell F-750	Or equal
Clow F-576	Mueller 2945	Victaulic 774	

PIV-2 Posts Indicator valve: Furnished for underground valves. Ductile iron fusion bonded epoxy coated resilient wedge gate valves: 4 inches and larger, class 175 lb, non-rising

stem, mounting plate for indicator post, UL/FM listed, flanged or mechanical ends (in accordance with NSF 61).

Stockham G-635	Kennedy 71X	Clow F-6100	Mueller 2360	Victaulic 772

O equal

O. Sprinkler Guards:

SPG-1 Sprinklers installed at seven feet six inches above floor or lower in exposed locations, or that are deemed subject to damage shall be equipped with a UL/FM listed, head guard. Guards shall be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer. Sprinkler head guards shall securely fasten with a bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at seven feet six-inch heights or lower.

Reliable	Viking	Tyco	FPPI	Victaulic

Or equal.

Q. Hangers, Supports, Bracing:

HSB-1 Tolco products or UL listed and FM or equal.

R. Threaded fittings:

TF-1 Ductile iron, 300 psi rated, UL listed, FM or NFPA approved.

TF-2 Cast iron fittings, 175 psi rated, UL listed, FM or NFPA approved:

Anvil	Ward	Taylor	Or

equal

TF-3 Malleable Iron, 300 psi rated, UL, Listed, FM or NFPA approved

TF-4 Galvanized, 175 psi rated, UL Listed, FM or NFPA approved

S. Fire Sprinkler Pipes and Standpipes:

FSP-1 Fire sprinkler pipe: 1 inch through 2-inch,to be Schedule 40. 2-1/2 inch and larger to be Schedule 10, black or galvanized steel meeting ASTM Standards A53, A135, or A795. Pipe Corrosion Resistance Ratio (CRR) shall be 1.00 or greater. Pipe may be threaded or grooved.

a. Piping 2 inches and smaller shall have threaded joints and fittings in concealed, non-accessible locations. Groove coupler connections (Victaulic, Viking VGS, or equal) on pipe sizes 1 inch through 2

inches are acceptable in accessible areas with required seismic bracing provided. Plain end connections such as “Plainlock” and “FIT” are prohibited.

b. For pipe sizes 2 ½-inch and larger, grooved type (Victaulic, Viking VGS, or equal), welded, threaded and flanged connections may be used. Any connection that does not utilize a threaded, welded or grooved connection is prohibited, except for mechanical tee bolt-on branch outlet fittings sizes 2-inch and smaller (Victaulic 920 and the 920N).

c. Submit Verification from manufacturer stating that piping material furnished meets above criteria; (i.e.: threadable pipe has a UL assigned CRR of 1.00 minimum, that it meets ASTM A53, A135 or A795, and it is UL listed, FM or NFPA approved.)

FSP-2 Ductile iron pipe, AWWA C151 (for pipes below grade). Gasketed self retaining joints per ASME/ANSI B16.4.

FSP-3 Plastic, PVC, thick wall (cast iron OD sized), DR 14 (200 PSI). UL listed for fire main service (underground). Gasketed self retaining joints - Johns Manville Blue Brute AWWA C900, JM Eagle C900 water pipe or equal.

FSP-4 Fire Sprinkler Pipe: 1 inch through 3-inch, Copper meeting NFPA 13 Standards. Pipe may be grooved.

FSP-5 Flexible Fire Sprinkler Head Connectors: 1 inch pipe size flexible stainless steel fire sprinkler head connectors “Flex Head Industries” Models 2024, 2036, 2048, 2060 and 2072, or equal..

2.3 ACCESSORIES AND APPURTENANCES

A. Escutcheons: Polished chrome plated split-ring type for exposed piping at every penetration inside finished rooms.

B. Guards: Provide sprinklers with guards at ceiling at or under seven feet six inches high and where subject to damage or vandalism.

C. Miscellaneous: Provide accessories and appurtenances for a complete system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe ends.

B. Remove scale and foreign matter, from inside and outside of pipes, before assembly.

C. Provide piping connections to equipment with flanged or grooved connections.

3.3 INSTALLATION

A. Install underground supply line connected to detector check or water main indicated. Braced or clamped bends shall be in accordance with requirements of NFPA 24. Provide vertical clamp rods at flange and spigot piece of risers, long enough to pass through riser's base flange where required. Furnish concrete thrust blocks where required. Tracer wire shall be installed as per Section 22 0553: Plumbing Identification on PVC underground piping.

B. Install FDCs, check valves, shut-off valves, gauges, Inspector’s test and drain assemblies and flow indicator. FDC must be installed so that it is unobstructed and accessible for the Fire Department’s first response unit.

C. Pipe through floors, wall, and ceilings, at head locations, shall be furnished with required sleeves, and escutcheons and fire caulking where indicated and/or required by code. Escutcheons shall be polished chrome plated unless other finish is selected by the Architect.

D. Sprinkler system shall be provided with complete drainage facilities in accordance with CBC standards. Drain discharge may discharge into a sewer, storm drain, sump pit or street gutter. Fire sprinkler drains shall not discharge onto a playground or across a sidewalk. Discharge to plumbing fixtures is prohibited due to the inability of a plumbing fixture to receive a full flow of water from a fire sprinkler drain valve under working pressure.

E. Upon completion of the Work of this section, and before Substantial Completion, subject the entire system, including underground supply connections, to tests as required by NFPA 13, and CBC standards and furnish the Owner with a certificate of compliance as required.

F. Close nipples are prohibited. Threaded unions are prohibited. Where a threaded union or coupling is needed, a groove type fitting (Victaulic or equal) shall be used instead. If a groove style coupling is used in a concealed area, an access panel allowing full access to that connection shall be provided.

G. Fire sprinkler systems piping hangers, seismic bracing, anchors and supports shall conform to NFPA 13, CBC and other applicable codes and the requirements of this specification.

H. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer.

I. Tee branch outlets on fire sprinkler mains shall be by the use of a threaded ductile iron tee fitting, a groove type tee fitting, (Victaulic or equal), or by the use of a thread-a-let welded on by a certified welder as required by NFPA. Mechanical tee bolted branch outlet fittings are prohibited except for branch outlet sizes 2-inch and smaller.

J. Sprinkler lines within the building shall be concealed within the structure. Risers shall be installed in utility, supply rooms or similar service areas whenever possible, and shall not obstruct access, or maintenance of other equipment within the space. Mains and risers shall be located within the area protected by the sprinkler system unless otherwise approved by fire authorities having jurisdiction.

K. Sprinklers that have been dropped, damaged, have cracked bulbs, or show a visible loss of fluid shall not be installed.

L. Sprinkler bulb protectors shall be removed by hand after sprinkler installation. Tools or other devices to remove the protector that could damage the bulb in any way shall not be used.

M. Routing of piping in non-concealed exposed areas shall be subject to the Architect's review in the final shop drawings.

N. Underground piping shall have a minimum of 36 inches of cover to grade. Underground pipe shall be installed on a flat not less than 6-inch thick undisturbed sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick, before backfilling. Comply with NFPA Standards. Piping is not allowed to be underground below the building floor slab.

O. Provide approved backflow prevention assemblies. Installations of backflow prevention assemblies shall be tested and certified by a certified by Los Angeles County backflow prevention device tester prior to Substantial Completion. Tests shall be performed in the presence of the Project Inspector. Test reports shall be turned over to the Project Inspector for mailing to proper agency.

P. Provide shunt trip when sprinklers are installed in the elevator machine rooms and elevator hoist way unless the sprinklers are located 2 feet or less from the hoist way pit floor.

Q. Test valve (ITV) shall be located at the opposite end of the sprinkler system from the supply. Test-and-drain type combination valves are prohibited. ITV discharge and main drain lines shall be piped to a sump pit or to the outside of the building to within a foot from the ground where it will drain away from the building to an exterior storm drain.

R. Each building with a sprinkler riser shall be furnished with an accessible shut off riser valve installed no higher than five feet from the finish floor. Each floor shall have a separate shut off valve with flow switch, and shall be securely enclosed or secured with a chain and break-a-way lock. Also see section 2.01- C-12 of this specification.

3.4 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.5 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose at off-project sites.

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DIVISION 22

PLUMBING

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section provides the basic plumbing requirements that apply to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.

2. Division 22: Plumbing

3. Division 23: HVAC

4. Division 26: Electrical.

1.2 REGULATORY REQUIREMENTS

A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.

2. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.

a. Test samples for lead content by the atomic absorption spectrophotometry method.

3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.

4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

B. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. ANSI - American National Standards Institute.

2. ASME - American Society of Mechanical Engineers.

   a. ASME Boiler and Pressure Vessel Code.
   b. ASME B31 - Standards for Pressure Piping.

3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.

4. ASTM - American Society for Testing and Materials.

   a. ASTM A53 Specification for Welded and Seamless Pipe.

5. AWWA - American Water Works Association.

6. CSA - Canadian Standards Association.

7. FM Global - Factory Mutual Global

8. IAPMO - International Association of Plumbing and Mechanical Officials.

9. NFPA - National Fire Protection Association.

10. OSHA - Occupational Safety and Health Administration.

11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

12. UL - Underwriters Laboratories Inc.

13. Intertek (ETL Certification).

C. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Plumbing Code.

   a. Latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3. OSHA - Occupational Safety and Health Administration.

4. CDPH - California Department of Public Health.

5. SCAQMD - South Coast Air Quality Management District.

D. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

E. Permits and Fees: Refer to the General and Supplementary Conditions.

1.3 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 22 sections, as applicable.

B. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe elevations, distances of pipes and equipment from building reference points and hanger support locations. The above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, piping and fittings.

1.4 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full-size reproducible plots on vellum and 3 sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return three copies of manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.
b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.
2) Trouble shooting checklist and guidelines.
3) Recommendations for optimum performance.
4) Warnings and safety precautions on improper or hazardous operational procedures or conditions

D. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 22 that includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.
2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
3) Directory of manufacturer’s representatives, service contractors and part distributors.
4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

E. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

F. Testing, Adjusting, and Balancing reports: Submit as specified in Section 23 0593.

G. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

H. Los Angeles County industrial waste permits.

I. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

J. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.5 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.7 PRELIMINARY OPERATION

A. OAR may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.8 TRAINING OF OWNER PERSONNEL

A. Training of Owner's personnel shall include:

1. A minimum of 4 hours of on-site overview of the overall Plumbing System.

2. Refer to Division 22 sections for specific training on each of the components of the Plumbing System.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.9 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

D. For substitution of materials or products, refer to the General Conditions.

PART 3 - EXECUTION

3.1 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.2 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes pass through, or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.

C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.3 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.4 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 22, including this Section.

B. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

C. Piping Tests:

1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.

7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

D. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Domestic water piping	200	Water
Standpipes, wet or dry	300	Water
Fire sprinkler piping	200	Water
Gas piping(steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Compressed air piping	175	Air

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8-hour periods at 90 percent of the full specified capacities.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

F. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, plumbing equipment and systems shall be operated and tested as indicated in Article 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 22 0513: Basic Plumbing Materials and Methods.

3.5 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.6 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pumps, compressors and similar equipment.

5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.

6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

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SECTION 22 05 13

BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section prescribes basic materials and methods generally common to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 22: Plumbing.
3. Division 23: HVAC.
4. Division 26: Electrical.
5. Section 32 8413: Potable Water Irrigation.
6. Section 32 8426: Reclaimed Water Irrigation.
7. Division 33: Site Improvements.

1.2 SUBMITTALS

A. Provide in accordance with Division 01, Section 22 0500 and specific requirements of each section of Division 22.

B. Types of welding rods to be used.

1.3 QUALITY ASSURANCE

A. Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC (California Plumbing Code), CMC (California Plumbing Code), CSA.

B. Conform to provisions of Section 22 0500: Common Work Results for Plumbing.

C. Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875.

D. Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the ARCHITECT.

1.4 COORDINATION

A. Coordinate related Work in accordance with provisions of Section 01 3113: Project Coordination.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.

B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 22 0500, manufacturer's instructions or as required.

1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.2 MANUFACTURERS AND MATERIALS

A. Ball Valves: 2-inch and smaller:

BV-1: Class 150, 600 psi, Bronze, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded or solder ends.

Manufacturer: Apollo Valves 77CLF-100A/77CLF-200A, NIBCO T-685-66-LF/S-685-66-LF, Hammond UP8303A/UP8513, Milwaukee UPBA400S/ UPBA450S, or equal.

BV-2: Class 150, 600 psi, Stainless Steel, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded or solder ends.

Manufacturer: Apollo Valves 76F-100, NIBCO T-585-S6-R-66-LL, Milwaukee BA260, or equal.

Ball Valves in Insulated Piping: Use extended operating handle of non-thermal conducive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied. Apollo Valves Therma-Seal, NIBCO Nib-Seal Handle.

B. Butterfly Valves:

BFV-1: Centerline Series A, 200 psi CWP tight shut-off.

Body: Lug type ductile iron. Suitable for bi-directional dead-end service at rated pressure without use of downstream flange.

Disc: Bronze, or aluminum bronze.

Stem: One or two-piece, 400 series stainless steel.

Seat and O-Rings: EPDM.

Upper and Lower Stem Bearings: Copper alloy or non-metallic material.

Operators: Valves 6 inches and smaller, with lever handle. Valves 8 inches and larger, with manual gear operator and disc position indicator.

Manufacturers:

a) Valves 2.5 to 6-inch: Apollo Valves LD141, Milwaukee ML 233E, Hammond 6411-03, or equal.

b) Valves 8-inch and larger: Apollo Valves LD141, Milwaukee ML 333E, Hammond 6411-03, NIBCO LD 2000, or equal.

C. Check Valves:

1. Bronze, 2-inch and smaller:

CHV-1: 200 psi, CWP horizontal swing, Y pattern, renewable seat and disc, threaded ends.

Manufacturer: Apollo Valves 163T-LF, NIBCO T-413-Y-LF, Milwaukee UP-509, Hammond UP-904, or equal.

CHV-2: 200 psi, CWP, bronze body, horizontal swing, Y pattern, renewable seat and disc, solder ends.

Manufacturer: Apollo Valves 163S-LF, NIBCO S-413-Y-LF, Hammond Up-943, or equal.

CHV-3: Class 125, 200 psi, swing check, bronze body, Teflon disc, soldered ends.

Manufacturer: Apollo Valves 163S, Stockham B-310TY, Crane 1340, NIBCO S-413-Y, Milwaukee 1509-T, Hammond IB-912, or equal.

2. Cast Iron 2 1/2-inch and larger:

CHV-4: Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, flanged:

Manufacturer: Apollo Valves 910F, Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

CHV-5: Special low-pressure check valve for installation in gas lines.

Manufacturer: Circle Seal Products Co., 119B-xPP; 0-15 psi; #1:1/8 inch IPS; #2:1/4 inch IPS #3:3/8 inch IPS.

D. Earthquake Valve:

EQV-1: Mechanically triggered by seismic movement, complying with state of California seismic response specifications, UL listed and certified by D.S.A. Size and pressure as required or indicated on Drawings. (Minimum 1/4 psi, maximum 10 psi. Earthquake valve shall shut off gas automatically during an earthquake to prevent an explosion or fire. Acceptable Manufacturers: California Valve (former Koso), or equal.

1. Not sensitive to vibrations caused by passing trucks or accidental bumping.

2. Sensitive to wide amplitude G's only. Preset at factory for the correct G-rating.

3. Positive sealing from minus 10 degrees F. to 150 degrees F.

4. Visual open-close indicator.

5. Manual reset.

6. Plumb line for mounting.

7. Tripping mechanism has non-creeping rolling latch.

8. Install valve per manufacturer’s recommendations only.

E. Expansion Tank:

ET-1: Pressurized, vertical, steel expansion tank for potable water systems with FDA approved, replaceable, heavy duty, butyl rubber blend diaphragm, polypropylene lined dome, 1/2 inch, 3/4 inch, 1 inch or 1 ½-inch NPT system connection, 1/2 inch or 3/4 inch drain, 0.302 inch-32 standard automobile tire valve type charging connection, lifting rings and a floor mounting skirt for vertical installation. The tank must be constructed in accordance with Section VII of the ASME Boiler and Pressure Vessel Code and stamped for 125 psi working pressure. The tank must be also rated for a continuous working temperature of 240 degrees F. Provide weather and rust resistant coating.

Manufacturer: Apollo Valves 16XT, Bell and Gossett, Wheatley, Taco, Amtrol, or equal.

F. Flow Control Valve – Manual:

FC-1: Flow control valves: Bell and Gossett Series CB circuit setter balancing valve, line size, with integral pointer (to register degree of valve opening), differential pressure meter connections with built-in check valves and lockable memory stops. Manufacturer: Apollo Valves 58A, Armstrong ARMFLO circuit-balancing valves, series CBV, or equal.

G. Gate Valves:

1. Bronze, 2-inch and smaller:

GV-1: Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Manufacturer: Apollo Valves 101T-LF, NIBCO T-113-LF, Milwaukee UP105-P2, Hammond UP645, or equal.

GV-2: Same as GV-1, except solder ends:

Manufacturer: Apollo Valves 101S-LF, NIBCO S-113-LF, Milwaukee UP115, Hammond UP647, or equal.

2. Iron, 2-1/2-inch and larger:

GV-3: Class 125 250 psi CWP iron body, flanged ends, bolted bonnet with wheel handle, resilient wedge, non-rising stem.

Manufacturer: Apollo Valves 610F-LFA, NIBCO F-619-RW, or equal.

GV-4: Class 125, 250 psi CWP iron body, flanged ends, bolted bonnet with 2-inch operating nut, resilient wedge, non-rising stem, fusion bonded epoxy coated.

Manufacturer: NIBCO F-619-RW-SON, or equal.

GV-5: Class 250, 250 psi, CWP, O S and Y, IBBM, resilient seat gate valve, flanged ends.

Manufacturer: Watts 408-OSYRW, or equal.

H. Globe Valves:

1. Bronze, 2-inch and smaller:

GLV-1: Class 125, 200 psi, CWP, screw-in bonnet, press ends:

Manufacturer: Apollo Valves 120T-LF, Milwaukee UP502-P2, Hammond UP440-P2, or equal.

GLV-2: Class 125, 200 psi, CWP, screw in bonnet, soldered ends.

Manufacturer: Apollo Valves 120S-LF, Hammond UP418, Milwaukee UP1502, or equal.

I. Heater Vent Pipe:

1. Schedule Number:

HVP-1: Shall be UL approved for service specified. Concealed heater vent pipe, including pipe in or through attic spaces, shall be Los Angeles City approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with Los Angeles City code and conditions of UL listing.

Manufacturer: American Metal Products Co., Inc., Simpson Dura-Vent, AmeriVent, Hart & Cooley Mfg. Co., Metalbestos, or equal.

HVP-2: For use in intake and exhaust of high efficiency condensing type gas water heaters only as required by manufacturer. Pipe shall be PVC, Schedule 40, extruded from 100 percent virgin polyvinyl Chloride (PVC) compound, meeting requirements of class 1254-13 of ASTM D1784. Manufacturer: Spears, Charlotte, or equal.

Fittings shall be Schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466.

Manufacturer: Spears, Charlotte, Harvel Plastics Inc., or equal.

J. Liquid Level Gage:

LLG-1: Refrigerant type, carbon steel with stainless steel trim or all forged steel construction, back-seating standard design. Upper and lower valve furnished with ball check valves; 1/2 inch diameter glass on center. Four 3/16 inch diameter gage glass guard rods or slotted steel guard.

Manufacturer: Peneberthy, Henry, Apollo Valves, or equal.

K. Piping and fittings:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in Section 22 0553: Plumbing Identification.

P-1: Cast iron: Hubless, service weight, ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO IS 6.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1a: Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 2 bands for size 1 ½-inch thru 4-inch, IAPMO, ASTM C 564 and CISPI 310.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1b: Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 4 bands for size 5-inch thru 10-inch. IAPMO, ASTM C564 and CISPI 310.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1c: Same as PF-1a with Heavy Duty Husky SD 4000 Coupling and stainless steel clamps. IAPMO, ASTM C564 and CISPI 310.

P-2: Galvanized steel, Schedule 40, ASTM A53.

Manufacturer: US Steel or equal.

PF-2: Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3.

Manufacturer: Stockham, Stanley Flagg, Grinnell, or equal.

P-3: Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306.

Manufacturer: Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead, or equal.

PF-3: Cast brass drainage fittings ASA B 16.23, ASTM B 42.

Manufacturer: Mueller Brass, Nibco, Stanley Flagg, Lee Brass, or equal.

P-4: Copper water tube, Type L hard, ASTM B88. (For above ground use only.)

Manufacturer: Mueller, Cambridge-Lee, Halstead, or equal.

PF-4a: Copper Press-Connect pressure fittings, comply with ASME B16.51 “Copper Alloy Press-Connect Pressure Fittings”, with Ethylene Propylene Diene Monomer, EPDM O-Ring Seal in each end. Fittings with the sizes of 2-1/2” and larger shall have cross-section Grab Rings and separation rings.

Manufacturer: Viega, Mueller Industries, Apollo, or equal.

PF-4b: Wrought copper - solder type ANSI B 16.22.

Manufacturer: Mueller Brass, Nibco, Lee Brass, or equal.

PF-4c: Grooved end type– ASTM B75 or B152 and ANSI B16.22 wrought copper, bronze sand casting per ASTM B584-87 copper alloy CDA 836 per ANSIbB16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type.

Manufacturer: Apollo Shurjoint, Victaulic, or equal.

P-5: Copper water tube, Type K hard, ASTM B88.

Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

P-6: Type 316L Schedule 40 Stainless Steel chemical waste pipe, marked with manufacturer's identification and fittings. Manufacturer's representative shall instruct installers and certify them for joint installation. Piping system shall be provided with a five-year manufacturer’s material warranty.

Manufacturer: Blucher-Josam, Viega, or equal.

PF-6a: Type 316L Schedule 40 Stainless Steel Mechanical joints. Stainless steel joint for chemical waste piping systems including drain or bottle traps.

Manufacturer: Blucher-Josam, or equal.

PF-6b: Type 316L Schedule 40 Stainless Steel Press Fittings. For chemical waste piping systems including drain, vent or bottle traps, provide with EPDM seals. For compressed air piping systems, provide with HNBR seals. Manufacturer's representative shall instruct installers and certify them for joint installation.

Manufacturer: Viega, or equal.

P-7: Black steel pipe, Schedule 40, ASTM A53, Type E, ERW.

Manufacturer: US Steel, or equal.

PF-7a: Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2-inches and below and welded for 2 ½-inch and above.

Manufacturer: Stockham, or equal.

PF-7b: Grooved end type, ASTM A395 and A536 ductile iron; ASTM A234 WPB forged steel; fabricated from ASTM A53 carbon steel. Couplings shall be supplied with angle-pattern bolt pads for rigidity, except in locations where flexibility is desired. Gaskets shall be pre-lubricated.

Manufacturer: Apollo Shurjoint, Victaulic, Galvanized or painted, or equal.

PF-7c: Press fittings, ASME B31, Carbon Steel, – For aboveground piping 2-inches and below. Provide fittings with Hydrogenated Nitrile Butadiene Rubber, HNBR Sealing Element.

Manufacturer: Apollo Valves: Power Press, Viega: MegaPressG, or equal.

PF-7d: Malleable Iron, class 125, ANSI B 16.3, threaded schedule 80 black steel.

Manufacturer: Stockham, or equal.

P-8: Red seamless brass 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43.

Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

PF-8: Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

Manufacturer: Mueller Brass, Lee Brass, or equal.

P-9: Underground site water service pipe sizes 4-inch and larger shall be C900 water service pipe material. Refer to guide specification section 33 1100 “site water distribution utilities”.

PF-9: Ductile Iron. Refer to guide specification section 33 1100 “site water distribution utilities”.

P-10: CPVC (Chlorinated polyvinyl Chloride) Laboratory Chemical Waste DWV pipe, in compliance with ASTM F2618 Standard for CPVC Chemical Waste Drainage Systems, and marked with a yellow stripe for identification as chemical waste drainage piping, and tested in compliance with UL723 (ASTM E84).

Manufacturer: Spears, Corzan, Charlotte, or equal.

PF-10: CPVC (Chlorinated Polyvinyl Chloride) DWV fittings, conforming to ASTM D3311, and UL723 (ASTM E84). The joints shall be of solvent cement type conforming to ASTM F493. Installer shall carry ASTM D2855 and ASME B31.3 qualification. Installer shall provide proof of these qualifications to IOR prior to commencing work.

Manufacturer: Spears, Corzan, Charlotte, or equal.

CPVC primer and solvent for chemical weld of pipe and fittings shall be as recommended by pipe manufacturer. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. The safety placards must be visible. Blue or red-hot glue shall not be used.

Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.

Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

Drains, bottle traps, mechanical joints, and similar devices shall be the same material and gauge as the pipe.

P-11: PVDF (Polyvinylidene Fluoride) schedule 40 chemical waste pipe, conforming to ASTM F1673, ASTM D3222 and complying with UL723 (ASTM E84). The joints shall be no-hub mechanical Joints or Socket Fusion. Installer shall be certified by manufacturer for joint installation.

Manufacturer: Orion, or equal.

PF-11a: PVDF (Polyvinylidene Fluoride), schedule 40, No-hub coupling. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this type of joint installation.

Manufacturer: Orion, or equal.

PF-11b: PVDF (Polyvinylidene Fluoride), schedule 40 coupling. Joined using the socket fusion system conforming to ASTM 2657. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: Orion, or equal.

P-12: FRPP (Flame Retardant Polypropylene) schedule 40 chemical waste pipe, conforming to ASTM F1412 and ASTM D4101. The joints shall be no-hub mechanical joints or Socket Fusion type. Installer shall be certified by the manufacturer for joint installation.

Manufacturer: Orion, or equal.

PF-12a: FRPP (Flame Retardant Polypropylene), schedule 40, No-hub coupling. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this type of joint installation.

Manufacturer: Orion, or equal.

PF-12b: FRPP (Flame Retardant Polypropylene), schedule 40 coupling. Joined using the socket fusion system conforming to ASTM 2657. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: Orion, or equal.

P-13: Polyethylene plastic pipe, ASTM D 2513, Standard Dimension Ratio 11 rated at 80 psi working pressure and 73° Fahrenheit for 3 inches and smaller, SDR 11.5 rated at 76 psi and 73° Fahrenheit for 4 inches and above, butt or socket type fittings, joined by heat fusion, orange or yellow color. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: CPCHEM (Chevron Phillips Chemical Company LP) PE 2406, or equal.

PF-13a: Polyethylene plastic fittings, ASTM D 3261 and D 2683, Standard Dimension Ratio 11 rated at 80 psi working pressure and 73° Fahrenheit for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73° Fahrenheit for 4 inches and above, butt or socket type fittings, joined by heat fusion, Installer shall be certified by manufacturer for joint installation. Color orange or yellow.

Manufacturer: CPCHEM, (Chevron Phillips Chemical Company LP), or equal.

PF-13b: Polyethylene transition risers, for PF-13a above, Transition fitting must have a minimum vertical height of 36 inches from the horizontal connection which will allow for a 6-inch steel riser above ground. Polyethylene transition risers shall be anodeless.

Manufacturer: GF Piping Systems, or equal.

P-14: PVC, schedule 40, extruded from 100 percent virgin Polyvinyl Chloride (PVC) compound, meeting requirements of class 1254-13 of ASTM D1784. (Use for irrigation systems after the control valves only.)

Manufacturer: Spears, Charlotte, or equal.

PF-14 Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466.

Manufacturer: Spears, Charlotte, Harvel Plastics Inc., or equal.

PVC primer and solvent for chemical weld of pipe and fittings shall be as recommended by pipe manufacturer. Containers for solvent and primer shall be clearly marked with manufacturer's data. Solvent and primer shall not be more than one year old. The safety placards must be visible. Blue or red hot glue shall not be used.

Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.

Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

P-15: Purple pipe, PVC, schedule 40 for reclaimed or recycled water (below ground only for non-potable irrigation systems), type 1, grade 1, PVC-1120, Cell Class 12454 B.

Manufacturer: Charlotte, or equal.

PF-15: Purple Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466. Refer to section 32 8426 “Reclaimed Water Irrigation”.

Manufacturer: Charlotte, or equal.

P-16: High Density Polyethylene pipe (HDPE) with tracer wire. Refer to guide specification section 33 1100 “site water distribution utilities”.

PF-16a: Butt Fusion HDPE Fittings. Refer to guide specification section 33 1100 “site water distribution utilities”.

PF-16b: Bolted Connections to HDPE pipes. Refer to guide specification section 33 1100 “site water distribution utilities”.

L. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I

PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Compressed air	All sizes	P-6	PF-6
Condensate drains and drains From HVAC Equipment	All sizes	P-4, or P-6 *Roof penetration & above, and exterior exposed piping shall be P-6 only	PF-4b, or PF-6b *Roof penetration & above, and exterior exposed piping shall be P-6 only
Domestic Cold Water, underground	Within 5’ from building, All sizes	P-5	PF-4a, or PF-4b
Domestic Cold Water, underground	Site distribution only, sizes up to 3”	P-5, or P-16 Refer to 33 1100	PF-4a, PF-4b, or P-16a, P-16b Refer to 33 1100
Domestic Cold Water, underground	Site distribution only, 4” and over	P-9 Refer to 33 1100	PF-9 Refer to 33 1100
Domestic Hot and Cold water, aboveground	Interior only	P-4	PF-4a, or PF-4b
Downspouts, Interior Storm Drainage	Within 5’ from building, All sizes	P-1	PF-1a, or PF-1b
Exposed Downspouts, Interior Storm Drainage	Existing Buildings and aboveground only	P-2	PF-2
Fire Mains (Fire Hydrants), Underground	Site distribution only, 4” and over	P-9 Refer to 33 1100	PF-9 Refer to 33 1100
Fire Suppression System, Interior	All sizes	P7 Refer to 21 1313	PF-7d Refer to 21 1313

Use	Limits	Pipe	Fittings
Irrigation, After Backflow Preventer	All sizes	P14 Refer to 32 8413	PF-14 Refer to 32 8413
Irrigation, Meter to Backflow Preventer	Up to 4”	P-5 Refer to 33 1100	PF-4a, or PF-4b Refer to 33 1100
Irrigation, Meter to Backflow Preventer	4” and over	P-9 Refer to 33 1100	PF-9 Refer to 33 1100
Irrigation, Reclaimed Water or Recycled Water	All sizes	P15 Refer to 32 8426	PF-15 Refer to 32 8426
Natural Gas, Exterior	Underground, site only	P-13	PF-13a, and PF-13b
Natural Gas, Interior, aboveground	All sizes	P-7	PF-7a, PF-7b, or PF-7c
Vents-ACID,	All sizes	P-6, P-10, P-11, or P-12 *Roof penetration & above shall be P-6 only	PF-6a, PF-10, PF-11a, PF-11b, PF-12a, or PF-12b *Roof penetration & above: PF-6a only
Waste - ACID - Aboveground - Passing through Air Plenum	All sizes	P-11	PF-11a, or 11b
Waste - ACID - Aboveground - Fire-Rated	All sizes	P-12	PF-12a, or 12b
Waste - ACID - Aboveground	All sizes	P-10	PF-10
Waste - ACID - Underground	All sizes	P-6	PF-6a, or 6b
Waste - FORCED	All sizes	P-1	PF-1c
Waste and Vent - Indirect	All sizes	P-3	PF-3
Waste and Vent – Sanitary/ Grease	All sizes	P-1	PF-1a, or 1b

Use	Limits	Pipe	Fittings
Waste and Vent – Sanitary/ Grease	Underground, site only	P-1 Refer to 33 3000	PF-1a, or 1b Refer to 33 3000

M. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Manufacturer: Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

Manufacturer: Hydra-Zorb Cushion Clamps, Acousto-Clamp, or equal.

N. Pressure Gage: Aluminum or steel case, minimum 4 ¼-inch dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three way gage cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gage.

PG-1 Pressure type, black drawn steel case, 4-1/2-inch glass dial, range approximately twice line pressure.

Manufacturer: Marsh Keckley, Trerice, Weksler, Weiss, or equal.

O. Plug Valves:

PV-1: 2 inches and smaller: Rockwell No.114, lubricated plug type, 200-pound., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc.

Manufacturer: Walworth, Homestead, WKM, or equal.

PV-2: 2 ½-inch and larger: Rockwell No.115 and No.165 lubricated plug type, 200 pound water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc.

Manufacturer: Walworth, Homestead, WKM, or equal.

P. Safety Relief Valves:

SRV-1: Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Manufacturer: Apollo Valves: 18C, Watts: 40L, Cash-Acme: NCLX-1, or equal.

SRV-2: Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Manufacturer: Apollo Valves: 18C, Watts: 100XL, Cash-Acme: NCLX-1, or equal.

SRV-3 Spring type, ASME and NB stamped and certified with manual lifting device for air or gas.

Manufacturer: Apollo Valves, Bailey, Cash-Acme, Watts, Keckley, or equal.

Q. Strainers:

STR-1: Description: Wye type with monel or stainless steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

2-inch and smaller:

C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley: Style B, Spirax Sarco Y-type, or equal.

2 ½-inch and larger:

C.M. Bailey No.100-A, 125 lb., cast iron body, flanged, or Victaulic style 732, 300 psi, ductile iron body, grooved, fusion bonded epoxy coated.

Manufacturer: C.M.Bailey, Armstrong, Muessco, Keckley 'A', or equal.

STR-2: Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 ½-inch and larger perforations, in accordance with the following:

Steam service - 40 square mesh.

Other services - 16 square mesh.

Bailey No.100, Armstrong, RP&C, Keckley or equal.

STR-3: Flanged, bucket type, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations, all sizes.

Manufacturer: Bailey No.1, Zurn 150 Series, RP&C, Keckley GFV, or equal.

STR-4: Grooved, T-pattern, ductile iron body, 300 psi, stainless steel frame and mesh basket, grooved ends.

R. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Manufacturer: Stoneman Engineering and Mfg., Semco 1550, or equal.

S. Vacuum Valves:

VV-1: Vacuum valves; for vacuum serve, 125 psig working pressure, cast iron body, spring loaded lubricated plug type.

Manufacturer: General Controls, Honeywell, Valmatic, or equal.

T. Protective Coating for Underground Steel Piping Applied to Underground Automotive:

1. Black steel or galvanized steel piping indicated for below grade installation, shall be protected as specified prior to delivery to the Project site:
   a. Sandblast black steel pipe to a gray finish. Sandblast galvanized steel pipe lightly only.
   b. Install one coat of cut back asphalt to galvanized pipe immediately after sandblasting. Pre-heat black pipe to 180 degrees F. immediately before coating.
   c. Install one coat of high-temperature (melting point of 240 degrees F. minimum) Grade B asphalt enamel.
   d. Install one wrapping of 20 mils thick glass, fiber mat, Owens-Corning Coromat or L.O.F. Blueflag with 1/4 inch overwrap. Glass fiber shall be dry at time of installation.
   e. Install a second coat of asphalt enamel as specified above. Glass fiber mat shall be centered in the asphalt enamel.
   f. Install an overwrap of Kraft ripple paper.

2. Total thickness of pipe wrapping shall be not less than 1/8 inch. Entire coating operation shall be accomplished by mechanical means in a continuous operation. Hand installation of protective coating is not permitted.

3. Each piece of wrapped pipe shall be legibly identified at no greater than 5 feet intervals by fabrication company. Each material submittal shall include the name of the fabrication company. Maintain one reviewed Sample on the Project Site.

4. Acceptable manufacturers of wrapping are: Hunt, Mobile, Conway or equal.

5. Fittings (including couplings), unprotected pipe adjacent to fittings, and damaged pipe protection shall be wrapped at Project site as follows:
   a. Fittings and pipe to be wrapped shall be thoroughly cleaned of material foreign to pipe manufacturer.
   b. Install one coat of Plicoflex No. 105 or Protecto Wrap No. 1170 adhesive primer to metal.
   c. Wrap pipe and fittings with a minimum thickness of 3/32 inch of Plicoflex No. 310 pipe line butyl molding tape, or Protecto Wrap No. 200 molding tape. Install 3

layers, each layer overlapping next approximately 2/3 width of tape, without stretching. Tape and primer shall be of the same manufacturer.

d. Wrap vinyl tape, 10 mil thickness, over molding tape with 1 inch minimum overlap.

e. Manufacturer: J.M. Trantex, 3M Scotchwrap or equal.

6. Pipe and fittings specified to be wrapped shall be tested with a holiday detector, after pipe has been installed in trench and before backfilling, in presence of the Project Inspector. Furnish a Tinkler and Raser model E-P holiday detector, or similar equipment for this test. Work, which is deemed defective, shall be repaired or replaced. The Project Inspector may test for damaged pipe wrapping after backfilling.

7. Instead of wrapping underground steel pipe as specified above, pipe may be machine-wrapped before delivery to the Project site as follows:

a. Pipe shall be cleaned of moisture, oil, grease, scale, and other foreign material by cleaning with non-oily solvent and wire brushing. Remove metal burrs and projections.

b. Install one coat of Plicoflex No.105 adhesive primer to cleaned pipe. If thinning is required, furnish only non-oily thinners as recommended by tape manufacturer.

c. Wrap coated pipe with Plicoflex No.340-25 tape (15 mil butyl and 10 mil vinyl laminate) Tape shall be installed by machine wrapping at approved plant only. Maintain tension (minimum of 5 pounds per inch of width) on tape over entire diameter of pipe. Tape shall be permanently identified and visible on vinyl side.

d. Fittings, unprotected pipe, and damaged pipe protection shall be wrapped as indicated above.

U. Flanges: Flanges shall be furnished and installed at each flanged connection of each type of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike. Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

TYPE OF PIPE	FLANGE
Screwed black or galvanized grooved steel pipelines.	125-pound black cast iron screwed flange, flat faced or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Welded or grooved steel pipe, except high pressure steam lines.	150-pound black forged steel welding flanges, 1/16 inch raised face ASTM A 105, Grade II or grooved flange adapters, Apollo Shurjoint 7041, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder end or grooved flange adapters, Apollo Shurjoint C341, Victaulic Style 641, Tyco-Grinnell Fig. 61, Gruvlok Fig. 6084, or equal.

1. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule:

SERVICE	TYPE
Cold water	1/16-inch-thick neoprene

Grooved end flange adapters supplied with pressure responsive elastomeric Gaskets supplied with grooved flange adapters shall be pre-lubricated by the manufacturer. Grade of gasket to suit intended service.

V. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):

   a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.

   b. Immediately downstream of any threaded connection to each manually operated threaded valve or cock, and each threaded check valve, yard box or access box except those in Freon piping systems, whether indicated or not.

   c. At each threaded connection to threaded automatic valves (except those in Freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.

   d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required

2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.

B. Pipe Installation:

1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.

2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.

3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the ARCHITECT.

4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.

5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.

6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.

7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the ARCHITECT, or indicated on Drawings.

8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.

9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.

10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the ARCHITECT.

11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 23 0500: Common Work Results for Plumbing.

12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.

13. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.

2. Sleeves shall provide ½ inch clearance around pipes, except plastic pipe shall have 1 inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.

3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.

4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between two or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.

5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the ARCHITECT.

6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.

7. Provide polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etcetera as specified in Section 22 1000 Plumbing. Provide polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion that neatly conceals pipe insert.

8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.

2. Welded joints in pipe shall be continuous around pipe and shall comply with ASME B31: Code for Pressure Piping, unless otherwise specified.

3. Each pipe weld shall be stamped with welder's identification mark. Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code, by an OWNER-recognized, DSA approved testing laboratory.

4. Before any welder performs welding on the Work, furnish the INSPECTOR with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months.

5. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an OWNER recognized, DSA approved testing laboratory.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:

a. Cracks of any type.

b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.

c. Elongated slab inclusions longer than 1/4 inch.

d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.

e. Undercuts greater than 1/32 inch.

f. Overlaps, abrupt ridges or valleys.

3. When a defective weld is detected by examination as outlined above, two additional welds shall be radiographed at locations selected by the Project Inspector. If the two selected welds demonstrate compliant welding, then the two tested welds shall be deemed to be in compliance. Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.

4. If either of the two selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.

5. Repair welding shall be performed in a manner in full compliance with ASME B31. The welded joints or repairs shall be spot examined with UT or radiographic tests in accordance with foregoing requirements.

6. OWNER shall cause to be performed additional random UT and radiographic examinations of welds. OWNER shall be responsible for the costs of any UT and radiographic examinations found to be in compliance with specified requirements.

7. Installer shall be responsible for the costs of UT and radiographic re-examinations of welds deemed defective Work and not in compliance with this Specification, and shall repair or replace said welds in accordance with specified requirements.

F. Welding Rods: Submit a written list of materials and proposed type of welding rods.

G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.

H. Qualification Tests for Low-pressure Welding:

1. Tests shall be performed on 3-inch standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of 2 pieces, each 10 inches long, with 30-degree bevel at point weld.

2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME Boiler and Pressure Vessel Code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.

3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.

4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.

5. A valid certificate of qualification issued in compliance with requirements of the ASME Boiler Pressure Vessel Code Section IX shall qualify a welder for issuance of a certificate for low-pressure pipe welding.

I. Certificates of Qualification for Welding of Unfired Pressure Vessels:

1. Certificates of qualification shall be issued by a laboratory recognized by the OWNER in compliance with the requirements of the ASME Boiler Pressure Vessel Code Section IX. Qualifications shall be for both acetylene and arc welding of Schedule 40 ASTM A53, Type B, steel welded or seamless pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.

2. Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding three months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.

J. Pipe Joints and Connections:

1. Pipe and tubing shall be cut per IAPMO Installation Standards. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.

2. Hot tapping of gas lines is strictly prohibited.

3. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:

a. Soap Piping: Litharge and glycerine, or Expando, Gasoila, or equal.

b. Plastic Piping: Teflon pipe joint compound tape.

c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.

d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.

e. Other services furnish sealant, suitable and as reviewed by the ARCHITECT.

4. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B2.1 for tapered pipe threads.

5. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and sealant of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or sealant to repair a leaking joint is not permitted.

6. Sharp-toothed Stillson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.

K. Copper Tubing and Brass Pipe with Threadless Fittings:

1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.

2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder.

3. Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.

4. Do not overheat piping and fittings when installing silver brazing.

5. Joints in non-ferrous piping for services not covered above shall be installed with solder composed of 95/5 tin/antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by Project Inspector to ensure joints are lead-free.

6. Grooved end joints for copper piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

7. Pressed fittings for copper or copper alloy pipe or tubing shall have an elastomeric O-ring that forms the joint. The pipe or tubing shall be fully inserted into the fitting, and the pipe or tubing marked at the shoulder of the fitting. Pipe or tubing shall be cut square, mechanically cleaned and reamed prior to joining to remove all burrs (interior and exterior) and restore full inside diameter and a smooth, chamfered exterior surface. The fitting alignment shall be checked against the mark on the pipe or tubing to ensure the pipe or tubing is inserted into the fitting. The joint shall be pressed using the tool recommended by the manufacturer.
   a. Press Installation Training Requirement: Installation training shall be provided on site by manufacturer personnel and documented with Engineer. Installation procedures, depth guides, and tool inspection shall be provided by manufacturer for all product types (steel or copper) for reference and safety assurance.

L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.

M. Welded Pipe Joints:

1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.

2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37 ½ degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.

3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.

N. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to grove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

O. Stainless steel press joints: Joints shall be Vic-Press 304TM, or equal, made with Victaulic Series ‘PFT’ tools and the appropriate sized jaw. Pipe shall be certified for use with Vic-Press 304TM system, and shall be square cut, properly deburred and cleaned, and marked at the required location to insure full insertion into the fittings and/or couplings.

P. Polyethylene (Plastic) Pipe:

1. Joints shall be installed by the heat fusion method, in accordance with manufacturer's recommendations and IAPMO installation standard IS 12, for natural gas.

2. Pipe Riser at Meter, Regulator and Building Wall: Prefabricated, anodeless type, utilizing a grade level transition between underground polyethylene pipe and gas supply steel pipe of riser outlet, GF Piping Systems, or equal. Below grade to above grade transition shall be installed in a welded, epoxy coated, steel casing.

3. Connections to Existing Pipe Line or Branch:

4. Provide PE reinforcing sleeves where PE pipe is fused to multi-saddles, service punch tee, reducing tees, transition fittings and anodeless risers.

Q. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.

2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.

3. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.

4. Provide chain operators on valves 2-inch and larger located 7 feet or more above the servicing floor level.

5. Valves for similar service shall be of one manufacturer.

6. Except where otherwise specified, valves shall be Apollo, Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American, NIBCO, Hoffman, or equal.

7. Ball valves below grade in yard boxes shall have stainless steel handles.

8. Hose bibs in dense garden areas shall be ¾ inch in size with one hose bib in the lunch pavilion 1 inch in size. Other hose bibs shall be ¾ inch lock shield type. Bibs shall be furnished with vacuum breaker protection.

9. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:

    a. On discharge side of each pressure-reducing valve.

    b. On each water heater connected to a hot water storage tank and other pressure vessels.

    c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.

    d. On discharge side of each air compressor.

    e. On each air receiver connected to an air compressor.

10. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this Section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects, based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

11. A combination temperature and pressure relief valve or combination of valves on each heating hot water storage tank. Temperature sending element shall extend into water inside tank.

12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.

R. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.

S. Hangers and Supports:

1. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.

2. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.

3. Piping shall not be supported by wire, rope, wood, plumbers' tape, or other non-recognized devices.

4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of five, based on ultimate tensile strength of material installed.

5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by ARCHITECT and DSA.

6. Burning holes in beam flanges or other structural members is not permitted without review by the ARCHITECT and DSA.

7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco I beam, Fig.62 for maximum 1000 pounds.

   b. Tolco I or WF beam, Fig. 329, for maximum of 1290 pounds.

9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:

   a. Tolco Fig.310 for maximum of 600 pounds.

   b. Tolco Fig. 309 for maximum of 1140 pounds.

10. For fastening to wood ceilings, beams, or joists, furnish Grinnell Fig. 128R, Grinnell Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3 inches long, with 2, staggered 10d nails, clinched over joist.

11. Pipe hanger rod sizes: 3/8-inch for pipe sizes ½-inch through 4-inch, ½-inch for pipe sizes 5-inch through 8-inch, and 5/8-inch for pipe size 10-inch through 12-inch.

12. Where rod hangers are used with a diameter greater than 3/8-inch, they shall be equipped with swivels or eye nuts to prevent bending in the rod.

13. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.

14. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.

15. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.

16. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.

17. Vertical Piping:

a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.

b. Copper tubing in sizes 1 ½-inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.

c. Copper tubing sizes 1 ¼-inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.

d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

18. Horizontal Piping:

a. Roof Mounted Piping: Pressure and non-pressure piping shall be supported from channels, stands, clamps, trapezes, rollers, or structures mounted on 100% rubber, UV resistant rooftop supports with reflective strips, Dura-Block, or equal. Roller type supports shall be provided below and above pipe to prevent its dislodgement. Bottom of pipes shall clear the roof surface by 10 inches.

b. Insulated steam and space heating hot water insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco Figure 4, B-Line Figure B3140, Grinnell Figure 212, or equal, steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco Figure 101L, B-Line Figure B3211X, Grinnell Figure 278, or equal.

c. Domestic cold water piping, water supply and return piping, condenser water piping, insulated refrigerant piping gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass to be supported with Tolco Figure 1, B-Line Figure B3100, Grinnell Figure 260, or equal, hangers with rods, turnbuckles and inserts suitable for above hangers.

d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

19. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

20. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

21. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI/ASME B31.1, ANSI/ASME B31.9, and NFPA Pamphlet 13.

T. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.

2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Install caps on top of heater pipes. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct by welding. No soldered joints on roof flashings will be allowed. No Stoneman lead roof flashings will be allowed.

3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 8 inches.

4. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.

5. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.

6. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, sealed or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of ¾ inch.

7. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.

8. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.

U. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 23 0548 even if not indicated on Drawings.

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SECTION 22 05 53

PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Marking and identification on mechanical piping systems, ducts, controls, valves, and apparatus.

B. Related Requirements:

1. Division 01: General Requirements
2. Section 21 1313: Fire-Suppression Sprinkler Systems.
3. Section 22 0513: Basic Plumbing Materials and Methods.
4. Section 22 1000: Plumbing.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.3 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 22 0500: Common Work Results for Plumbing.
2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.
3. APWA: Uniform Color Code.
4. IAPMO: Uniform Plumbing Code (UPC)

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.2 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.

E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters and marked "Danger"); submit Sample tag to the Architect for review.

2.3 INSTRUMENTS AND CONTROLS

A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.

B. Identify alarm indicating devices and alarm reset devices by nameplates.

C. Identify automatic valves, flow switches, and pressure switches, with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.4 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the “As-Built Drawings”. Room numbers in the nameplates shall correspond to the final room numbers.

2.5 ABOVE GRADE PIPE IDENTIFICATION

A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.

B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.

C. Size:

Outside Diameter of Pipe or Insulation (in inches)	**Length of Color Field (in inches)**	**Size of Letter (in inches)**
¾ to 1 ¼	8	½
1 ½ to 2	8	¾
2 ½ to 6	12	1 ¼
8 to 10	24	2 ½
over 10	32	3 ½

D. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etcetera.).

2. Near each valve and branch connection in such accessible piping.

3. At each pipe passage through wall or floor.

4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.

5. At each change in direction.

E. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels.

F. Color Schedule:

Content of Pipe	**Legend**	**Background Color**	**Lettering Color**

Domestic cold water	Domestic. C.W.	Green	White
Non-potable cold water	Caution: Non-potable Water Do Not Drink (1)(2)	Purple	Black
Domestic hot-water 140ºF	Domestic H.W. 140ºF	Blue	Black
Sanitary waste	San waste	Green	White
Sanitary vent	San vent	Green	White
Storm drain or downspout	Storm drain	Green	White
Indirect drain	Ind drain	Green	White
Sump pump discharge	Pump discharge	Green	White
Fire sprinkler supply	Fire Sprinkler supply	Red	White
Fire sprinkler drain	Sprinkler drain	Red	White
Fuel oil	Diesel oil	Yellow	Black
Gas	Gas	Yellow	White
Reclaimed Water	Caution: Reclaimed Water Do Not Drink (1)(3)	Purple	Black

H. Notes on Schedule:

1. Note (1) indicates 2 ¼ inch by 1 inch yellow label with ½ inch letters reading UNSAFE WATER at one end of primary label.

   Note (2) words should read “CAUTION: NONPOTABLE WATER DO NOT DRINK.” with international do not drink symbol.

   Note (3) words should read “CAUTION: RECLAIMED WATER DO NOT DRINK.” with international do not drink symbol.

2.6 UNDERGROUND PIPE

A. Detectable Marking Tape:

1. Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.

2. Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.

3. Detectable marking tape shall be color-coded per APWA Color Code:

   a. Yellow: Oil and gas.

   b. Blue: Water, irrigation and slurry lines.

   c. Green: Sewer and drain lines.

B. Tracer Wire:

1. Solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistant insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.2 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

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SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation for plumbing piping.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 22 0500: Common Work Results for Plumbing.
3. Section 22 0513: Basic Plumbing Materials and Methods.
4. Section 22 0553: Plumbing Identification.
5. Section 22 1000: Plumbing.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
2. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
3. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
5. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

8. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories, Inc.

1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. California Code of Regulation Title 24.

1. California Green Building Standards Code.

1.3 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

1. Complete material list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.

3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.

4. Display sample cutaway sections.

5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.4 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 22 0500: Common Work Results for Plumbing and Section 22 0513: Basic Plumbing Materials and Methods.

B. Insulation Work shall be in accordance with the California Building Energy Efficiency Standards, CBC, and Uniform Mechanical Code and the California Green Building Standards Code.

C. Test Ratings:

1. Comply with provisions stated under Section 22 0500 and 22 0513 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.

2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

D. Regulatory Requirements: Insulation furnished and installed under this Section shall meet minimum legal requirements of the Building Energy Efficiency Standards adopted and incorporated in the California Energy Commission, Title 24, Part 2, Chapters 2 through 53 and the California Green Building Standards Code unless otherwise noted, for the piping,

E. Chemically based products such as sealers, primers, fillers, adhesives, etcetera must meet the California air quality regulations.

1.05 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 22 0500: Common Work Results for Plumbing and 22 0513: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. Insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Insulating material shall be furnished with thickness indicated in Table 1, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

   a. Nylon anchors for installing insulation to equipment.

   b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)

Piping System Type	Temp. Range (degrees F)	Runouts up to 2 (2)	1 and less	1.25 to 2	2.5 to 4	5 to 6	8 and larger
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.5	1.5	1.5	1.5
Condensate Drain	½ inch minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From A/C Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES:

(1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Runouts to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Provide 6 ounce, in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8-inch shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10-inch to 18-inch shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.2 DOMESTIC HOT WATER PIPING SYSTEM INSULATION

A. General: Insulate domestic hot water supply and return piping, including valves, strainers and fittings with insulation thickness as indicated on Table 1.

B. Materials:

1. Classes of Insulation:

a. Class A: Glass fiber molded pipe insulation suitable for service temperatures up to 850 degrees F. Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4.0 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, Knauf Redi-Klad 1000, Owens Corning FIBERGLAS Pipe Insulation SSL II-ASJ, or equal.

b. Class B: Flexible open-cell melamine (foam insulation) suitable for service temperature -150 degrees F to 400 degrees F. Thermal conductivity at 75 degrees F, K= 0.26. Pipe insulation, one-piece pre-formed, laminated to heavy non-reinforced PVC jacket, with locking track, factory installed to jacket, to snap insulation and jacket onto pipe. Similar to TechLite 079 Series as manufactured by Accessible Products Co., or equal. Installation shall comply with manufacturers recommendations.

c. Class C: Mineral fiber pipe insulation suitable for service temperatures up to 1200 degrees F. Pipe insulation shall be one-piece, preformed up to 3 inches thick, and provide a minimum R factor of 4.0 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire-retardant vapor barrier jacket. Pipe insulation shall be 8 pounds in accordance with cubic foot density by Roxul Techton 1200, Fibrex COREPLUS 1200, Industrial Insulation Group, LLC (IIG) MinWool-1200, or equal.

2. Locations and Class of Insulation Required:

TABLE 2 – LOCATIONS AND CLASS OF INSULATION REQUIRED

LOCATION	CLASS OF INSULATION
Equipment Room	A, B or C
Other Locations	A, B or C

3. Fittings on indoor piping shall be covered with flush, hand-wrapped Class A, B, or C insulation, to match the adjoining pipe insulation and covered with polyvinyl chloride fitting covers: Zeston 2000 25/50 by Johns Manville, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal.

4. Adhesive: Fibrous Adhesive to bond calcium silicate to itself and non-porous surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where firestop or firesafing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On unions, flanged connections or valve handles.

2 Over edges of any manhole, clean-out hole, clean-out plug, and to restrict opening or identification of access.

3. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.2 INSTALLATION OF DOMESTIC HOT WATER PIPING SYSTEM INSULATION

A. General: Domestic hot water, tempered water supply and return piping and condensate return piping, after having been tested, shall be cleaned and insulated.

B. Application: Insulate condensate return piping, domestic hot water supply and return, including tempered supply and return piping in accordance with manufacturer's instructions and as specified herein.

1. Install insulation on valve bodies up to valve bonnet. Fill void in saddles, in accordance with Section 22 0513: Basic Plumbing Materials and Methods, with insulation and seal joints.

2. Install insulating material to fittings, valves, and strainers and smooth to thickness of adjacent covering. Leave strainer clean-out plugs accessible. Covers fabricated from polyvinyl chloride shall be furnished.

C. Insulation Jackets in Exposed Indoor Locations:

1. Cover completed insulation with canvas jacket tightly pasted to covering with lagging adhesive. Lap jacket seams 1 1/2-inch minimum. Finish entire jacket with coating of undiluted adhesive.

2. Equivalent factory applied pre-sized, glass fiber reinforced, or glass fiber jackets may be furnished. Seal jacket seams with adhesive in accordance with manufacturer's instructions.

3. Johns Manville Zeston 2000, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal, fitting covers may be furnished, with molded or segmented insulation equal to specified insulation applied to fittings. Secure covers in accordance with manufacturer's instructions.

4. In addition to above requirements, cover exposed insulated piping within a distance of 8 feet above floors with 26 gage galvanized steel jacket. Omit jacket in areas accessible only to maintenance personnel, such as mechanical equipment rooms, utility corridors, accessible pipe tunnels and manholes.

D. Concealed Indoor Locations: Cover insulation over fittings, valves, and strainers with canvas. Provide pipe insulation with factory or field applied standard jacket of 4 ounce minimum canvas, fiberglass cloth, or glass fiber reinforced jacket. Seal jacket laps with adhesive in accordance with manufacturer's instructions.

E. Exposed Outdoors: In addition to canvas or fiberglass cloth cover, pipe insulation exposed to weather shall be provided with an additional 0.016 inches thick aluminum jacket with 2-inch lap connected with one inch hem overlap joint located on side of pipe and turned down to shed water. Jacket shall be strapped 12 inches on center with ½-inch wide stainless steel strapping and wing seals. Aluminum jacket shall be mitered to fit fittings.

3.3 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.4 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

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SECTION 22 10 00

PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Labor, materials, tools, and equipment to install plumbing systems as indicated.

B. Related Sections:

1. Division 01 - General Requirements.
2. Section 07 9200: Joint Sealants.
3. Section 10 4413: Fire Extinguishers and Cabinets.
4. Section 11 4013: Food Service Equipment.
5. Section 22 0500: Common Work Results for Plumbing.
6. Section 22 0513: Basic Plumbing Materials and Methods.
7. Section 22 0553: Identification for Plumbing piping and Equipment.
8. Section 22 0700: Plumbing Insulation.
9. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.
10. Section 31 2323: Excavation, Backfill for Utilities.
11. Section 33 3000: Site Sanitary Sewer Utilities.

1.2 SUBMITTALS

A. Provide in accordance with Division 01 and Section 22 0500: Common Work Results for Plumbing.

B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.3 QUALITY ASSURANCE

A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.

B. Conform to provisions of Section 22 0500: Common Work Results for Plumbing.

C. Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875.

1.4 PRODUCT HANDLING

A. Conform to provisions of Section 22 0513: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS

A. Materials: Refer to Section 22 0513: Basic Plumbing Materials and Methods.

B. Insulation for Piping: Refer to Section 23 0700: Plumbing Insulation.

2.2 FIXTURES AND DRAINS

A. General: Fixtures specified shall be furnished complete with trim and fittings. Cast iron plumbing fixtures shall be acid resistant enamel, and identified by casting letters "AR" or words "acid-resistant" into metal. Fixtures shall be white unless otherwise specified. Cast iron fixtures shall be white enamel inside and on back, rim and apron, with exposed unfinished surfaces painted white. Fixtures of same general classifications shall be of same make.

B. Finished Brass:

1. Unless otherwise specified, finished brass of a similar type shall be of same manufacturer and model throughout buildings.

2. Finished and exposed brass plumbing, except floor, shower and urinal drains shall be chromium-plated and polished. Floor, shower and urinal drains, unless otherwise specified, shall be nickel-bronze metal.

C. Traps, Trap Arms and Tailpieces:

1. Fixture Traps shall be all L.A. Code Cast Brass Chromium-plated and polished. Exceptions as follows:

a. Traps that are an integral part of a fixture.

b. Traps concealed in floors, walls and furring.

c. Traps standard for service sinks and Industrial Shop equipment.

d. Laboratory traps and tailpieces shall be as specified in section 22-0513 “Basic Plumbing Materials and Methods”.

2. Trap Arms shall be all IPS Threaded Brass Nipples into Female IPS Threaded Drainage Tee.

3. Tailpieces, Extension Tailpieces, 2-part wastes and any other tubular products shall be minimum 17 gage polished chromium-plated brass, except as otherwise specified.

4. Furnish polished chromium-plated brass wall flanges with setscrews and polished chromium-plated brass cover casing on discharge side of each trap.

D. Faucet Valve Handles: Faucet and shower valve handles shall be solid brass, chromium-plated and polished, and fastened to their stems by Allen type hollow head stainless steel set screws through the side of the handle extending into the stem. Handles with sharp edges or projections shall not be furnished. At accessible fixtures: handles shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate handles shall be 5 pounds maximum.

E. Fixture Supplies:

1. Supplies for water heaters shall be unplated rigid copper water tube with threaded adaptors for connections to valves and other threaded connections. All other supplies shall be chromium-plated brass with hospital threads or shall be furnished with fittings and valves, which completely cover threads.

2. Supplies to water closet tanks, lavatories, and drinking fountains shall be furnished with a NSF 372/61 threaded brass nipple. Exposed unfinished piping shall be sleeved with chrome plated brass or copper cover casing and have an appropriate escutcheon for a clean finished appearance. Angle/straight valve stops shall be female 1/2 IPS (inlet) by 3/8 compression (outlet). Fixture supplies shall be polished chrome-plated, solid supply bulbed end risers with size compatible supply nut connection to fixture and 3/8 O.D. compression nut and ferrule connection to angle stop outlet. Stainless steel flexible braided connectors with re-enforced PVC inner hose are not allowed.

3. Hot and cold water fitting supply outlet piping serving water closets, urinals, lavatories, drinking fountains, sinks, faucets, hose bibs, and sillcocks shall be iron pipe size (IPS) brass nipple, and piped in such a manner that through wall water supply outlet piping be removable, size appropriate, and lead free. The use of copper, copper MIP sweat adapters or similar fittings, in lieu of brass nipples is not allowed. The IPS brass nipple shall be directly connected to the fixture as follows:

   a. Control stops for water closet and urinal flush valves.

   b. Angle stop for lavatories, sinks and drinking fountains.

   c. Shank/arm adapters for wall mounted sink faucets.

   d. Iron pipe size (IPS) brass nipple connection for hose bibs, sillcocks, and other plumbing related fixture and/or plumbing fitting water supply outlets.

4. Water supply pipe that penetrates a finished surface, wall, countertop or part of a cabinet shall be appropriately sized polished chromium-plated cover casing and wall flange/escutcheon fitting tight to the brass through wall nipple and securely affixed to the finished wall surface.

5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.

2.3 ACCESS PLATES (TO CLEANOUTS, VALVES, WATER HAMMER ARRESTORS AND HOSE FAUCETS)

A. Schedule Numbers:

AP-1: Square, unless otherwise noted, steel, prime coated; frame, 18 gage minimum. Door shall be 16 gage minimum with concealed hinge or be removable, with vandal-proof lock operated by Allen wrench.

SMITH	ZURN	ELMDOR	MILKOR	WATTS	MIFAB	JOSAM
Fig 4760 AK	Z-1462-VP	DW-AKL	MOR DW AK1	CO-300-S-6	UA-A	58650-VP OR EQUAL

AP-2: Round type, stainless steel, vandal-proof, 5/16 inch No. 18 or 1/4 inch No. 20 flat-head machine screw into cleanout plug. Plate shall be prime coated minimum 18 gage steel or polished chrome-plated brass, 18-8 No. 302 stainless steel, or polished nickel bronze.

SMITH	ZURN	JOSAM	WADE	WATTS	MIFAB	OR EQUAL
4710U	Z-1469-VP	58600	8480R	CO-480-RD-6	C1400-RD-6	

AP-3: Square, polished face chrome-plated bronze, aluminum alloy or brass chrome-plated brass frame with 14 gage polished 18-8 No. 302 stainless steel or brass chrome-plated secured cover with vandal-proof screws.

SMITH	ZURN	WADE	WATTS	MIFAB	JOSAM	OR EQUAL
4735U	Z-1460-VP	58630	CO-300-S-6	C1400-S-3-6	58640-VP	

AP-4: Square, floor type, cast nickel-bronze aluminum alloy or brass, with Carborundum or Scoriated, secured top.

SMITH	ZURN	JOSAM	WATTS	MIFAB	OR EQUAL
4910U	Z-1461-VP	58630	CO-300-S-6	C1300-S-6	

2.4 BACKFLOW PREVENTION ASSEMBLIES

A. Schedule Numbers:

BPV-1: Pressure vacuum breakers ½ inch to 2 inches, Los Angeles City approved.

WILKINS	WATTS	FEBCO	OR EQUAL
375 and 975 XL (for uninterrupted service)	LF009-QT; LF909-NRS	LF860	

2.5 BACKWATER SEWER VALVE ASSEMBLY

A. Schedule Numbers:

BSV-1: Cast iron with access cover, Los Angeles City approved type, with line size gate valve upstream and downstream.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
7022-S	Z-1090	BV-200	BV-1000	67500	

2.6 CLEANOUT ASSEMBLIES

A. Cleanout plug shall be line size.

B. Schedule Numbers:

CO-1: Iron body cleanout tee full line size up to 4 inches and round access plate, plugs shall be brass, countersunk with tapped boss for 5/16 inch No. 18 or ¼ inch No. 20 screws. (Specify for finished walls at base of waste stack, above urinal and service sink.) AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4532-U	Z-1446-BP	CO-460-RD-34B	C1460-RD-6	58600-CO	

CO-2: Iron body with approved UPC plug, top and adjustable sleeve, cut-off ferrule, polished scoriated brass nickel bronze secured cover. AB&I and TYLER may be used as iron body cleanouts. Trim and accessories shall be Smith or Zurn or equal

Square:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6	55000-1-SQ	

Round:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4033-L-U-NB	ZN-1400	CO-200-R	C1220-1-6	55000-1	

CO-3: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferule, UPC. Brass approved type plug, scoriated tractor type cover.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4233-U	ZN-1400-HD	CO-200-RX-4	C1220-4-6	55000-22	

CO-4: Tapped soil tee with brass plug, full line size.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4512	Z-1445-	CO-460-34A	C1460	58910	

CO-5: Raised threaded head brass plug.

ZURN	WATTS	SMITH	JOSAM	OR EQUAL
Z-1470-A	CO-590	4285	58540-20	

2.7 CIRCULATING PUMPS, HOT WATER HEATING SYSTEM

A. Schedule Numbers:

CPH-1: Centrifugal, single stage, close coupled with adjustable cast iron base, bronze enclosed impeller, lead-free mechanical shaft seal suitable for water temperature range from 20 degrees to 300 degrees F. Screwed or flanged connections. GPM and TDH capacities as indicated.

BELL & GOSSETT	WEIMAN	GRUNDFOS	TACO	OR EQUAL

CPH-2: In-line mounted. Close coupled, centrifugal type with an all bronze water chamber, bronze sleeve bearings, bronze impellers, water tight shaft seal suitable for water temperature range from 20-300 degrees F. Forged steel shaft. It must be provided with bracket support to damper vibrations. GPM and TDH capacities as indicated.

BELL & GOSSETT All Bronze	GRUNDFOS	TACO	OR EQUAL

2.8 DRINKING FOUNTAINS OR ELECTRIC WATER COOLER

A. Also see Electric Water Coolers, below.

B. Drinking Fountains shall be provided with brass free waterways and provisions for future installation of water filter as required.

C. Schedule Numbers:

DFWF-1: In-line Head Assembly and Bypass Plug to be installed within a recessed access panel per LAUSD Standard Technical Drawings for future installation of drinking fountain cartridge DFWF-1a.

MANUFACTURER	PART NUMBER	
AQUA PURE/3M	6213063 3M ID Number: 70-0203-5155-0	OR EQUAL

DFWF-1a: In-line Cartridge for drinking fountains, with ANSI/NSF 61, ANSI/NSF 372, CSA-B483.1-07, and ANSI/NSF 53 listed 1/4 Turn Cartridge with 0.5 Micron sediment/Carbon pre-filter.

FILTER	MODEL	
3M/AQUA PURE	3MFF101	OR EQUAL

2.9 DRUM TRAPS

A. Schedule Numbers:

DT-1: Extra heavy cast iron, bolted top.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
8714	ZA1180	SI-742-X	MI-SOLID-S	61030	

DT-2: Aluminum solid interceptor, furnish for on-floor installation.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
8710-AA	Z-1180	SI-742	MI-SOLID-S-AL	61030-26	

2.10 DIELECTRIC UNIONS

A. Schedule Numbers:

1. Dielectric style Unions using ferrous and no-ferrous metals are prohibited. Dielectric flanges are admitted for use – see DU-2.

DU-1: Lead Free Brass union with 6-inch Lead Free Brass nipple.

DU-2: Lead Free Brass union or Lead Free Brass flanged fittings are to be used in between pipes made of dissimilar metals to prevent accelerated corrosion and deterioration in the piping systems due to galvanic and stray current.

WATTS	WILKINS	ZURN	NIBCO	OR EQUAL
LF3100M3			733-LF	

2.11 ELECTRIC WATER COOLERS OR DRINKING FOUNTAIN

A. Water Coolers shall be provided with brass free waterways and lead mitigating water filtering systems (DFWF).

B. Schedule Numbers:

EWC-1: Wall-mounted electric chiller type UL listed for access compliant with minimum capacity of 8.0 GPH certified to comply with Air Conditioning and Refrigeration Institute (ARI) Standard 1010/73. Fountain with brass free waterways shall be furnished with stainless steel apron and cabinet push bar operated bubbler, automatic stream regulator, brass P-trap, and hermetically sealed, air-cooled condensing unit with 115 volt, single phase 1/5 HP motor with thermal overload protection (Hubbell No. 5264 or equal). Provide with approved 3-wire grounding cord and connector. Complete water cooler must have been tested and certified to ANSI/NSF 61 and NSI/NSF 372 lead free.

A. Dual-height electric water cooler, same mechanical specification as EWC-1 except fully access compliant, with dual height stainless steel drinking fountains sharing a common waste, water supply and refrigeration. Complete water cooler must have been tested and certified lead free to ANSI/NSF 61 and NSI/NSF 372 lead free.

(To be specified for Administration Area, and Teachers' Lounge.)

MURDOCK	ELKAY	HALSEY TAYLOR	OR EQUAL
A172408F-UBL	VRCHDTL8SC	HAC8BLPV-NF	

2.12 FAUCETS

A. Access compliant faucets: Force to activate controls shall be no greater than 5 pounds. Self-closing metering, where specified, to remain open 10 seconds minimum when activated. Handles shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

B. Schedule Numbers:

F-1: Wall mounted ¾ inch hose-thread spout faucet with vacuum breaker with integral service stops and top wall brace, adjustable eccentric union inlet connections, rough chrome.

CHICAGO	AMERICAN STANDARD	ZURN	OR EQUAL
897-RCF	8344.112-RC	Z843MI-RC	

F-2: Wall mounted stainless steel 8 inch spread faucet with lever handles and 8 inch swing spout with brass free waterways.

FISHER	OR STAINLESS STEEL EQUAL
53112	

F-3: Deck mounted stainless steel 8 inches wide spread faucet, with 8-inch swing spout, aerator and lever handles.

FISHER	OR STAINLESS STEEL EQUAL
57649	

F-4: 4-inch center set lavatory faucet self-closing metering, to remain open 10 seconds minimum when activated., Hot and cold water inlets, adjustable time cycle and chrome plated finish. Provide with copper tubing connectors. To be used with 4-inch center set Lavatory Sink.

CHICAGO	ZURN	T & S	OR EQUAL
3600CR44597AB	Z86500-XL	B-2760-H	

F-5: Flushing Rim Sink faucet with atmospheric Vacuum breaker, ¾-inch hose tread outlet and wrist blade handles.

CHICAGO	ZURN	T&S BRASS	OR EQUAL
814-VBCP	Z842D6-LSI-5XT	B-0651-06 W/ 6” INCH WRIST HANDLES	

F-6: Deck mounted, stainless steel, 4-inch center set lavatory faucet wrist blade handles, hot and cold water inlets and chrome plated finish.

FISHER	OR STAINLESS STEEL EQUAL
58750 or 58696 with 6-inch gooseneck	

F-7: Wall mounted, hot and cold faucet, chrome plated, with lever handles and 9 or 9 ½-inches goose-neck spout.

CHICAGO	ZURN		OR EQUAL
445-L9E35ABCP	Z842J1-XL-5F		

F-8: Deck mounted, hot and cold faucet with lever handles, rigid swinging goose-neck spout and aerator.

CHICAGO	ZURN	T&S BRASS	OR EQUAL
50-E35ABCP	Z826B1-XL	B-0300-VR	

2.13 FLOOR DRAINS

A. Schedule Numbers:

FD-1: Cast iron body, no hub with seepage pan and flat, round nickel bronze strainers not less than 5-inch diameter for 2-inch outlet bodies, 7-inch for 3-inch outlet bodies and 8-inch for 4-inch outlet bodies, with maximum of ½ inch square holes or slots not larger than ¼ inch by 1 ¼-inch.

(To be specified for use in locations other than tile floors.)

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2005Y-A	ZN-415-B	FD-100-A	F1100-C-1	30000-A	

FD-2: Same as specified for FD-1, except with square tops.

(To be specified for use in tile floors.)

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2005Y-B	ZN-415-S	FD-100-M	F1100-C-S-1	30000-S	

FD-3: Area type, with 8-inch diameter minimum cast iron top grates (no hub). Drain shall be vandal-proofed by securing grate to body with stainless steel Allen flat-head screws.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2110-Y-U	Z-550-VP	FD-320-Y-6	F1320-4-6	32100-VP-Z	

FD-4: Pavilion type with cast iron hinged top, with removable sediment bucket. Drain shall be vandal-proofed by securing grate to body with stainless steel Allen flat head screws. No hub; 4-inch drain in lunch area in lieu of clarifier.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2230-Y-H-U	Z-610-H-NH-UP Z-541-NH-VP-H	FD-340-Y-SET-9-6	F1340-TFB-4-6	37810-14-VP-Z	

FD-5: Gang shower, cast iron body with 5-inch diameter nickel-bronze vandal-proof strainer. No hub.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL

2005-Y-NB-U-(A)	ZN-415-B-VP	FD-100-A-6	F1100-C-1-6	30000-A-VP	

FD-6: For indirect waste. Cast iron body, with vandal-proof nickel-bronze top and funnel. No hub.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
3510-F11-NB5	ZN-415-E	FD-100-EF-1	F1100-C-EF-1	30000-E2-VP	

FD-7: Drain parking garage floor (emergency drain) with cast iron body, flashing collar and cast iron tractor grate NO hub, vandal-proof top.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2120Y-U	ZN-508-9-INCH VP	FD-320-Y-6	F1320-4-6	32100-TG-VP	

FD-8: Area drain, cast iron body, round pedestrian grate set in square frame.

SMITH	ZURN	WATTS	MIFAB	JOSAM	EQUAL
1470Y-U-NB	ZN-158-VP	RD-200-CP-L-1	F1100-C-S8-1-6	23730-VP	

FD-9: Planter drain, cast iron body, secured bronze dome with stainless steel mesh screen.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
2646Y	ZRB-352 with Z-1040 adaptor	FD-860	F1810-6	39600	

FD-10: Trash Drain Wash down Area Drain: Waste water diversion valve drain acts as an area drain for sanitary and rain drainage. When the hose Bibb is activated, the drain automatically diverts run offs to sanitary drain. Unit shall be approved by Los Angeles Testing Laboratory.

FOX Waste Water Diversion Valve System:	OR EQUAL

DD 600	

2.14 FLEXIBLE HOSES

A. Schedule Numbers:

FLH-1: Braided stainless steel metal hose (for gas use). US Flex, Metraflex, Nelson Dunn or equal.

FLH-2: Braided bronze metal hose (for non-pressure condensate connection use). US Flex, Metraflex, Nelson Dunn or equal.

2.15 FLUSH VALVE ASSEMBLY

A. Valves shall be furnished so that flush remains constant and will not require any adjustment.

1. Each flush valve shall be provided with a loose key, square shank, lock shield angle service stop connected to flush valve with a union connection.

2. Provide l7 gage pressed brass escutcheons for wall and fixture. Escutcheons shall be fastened to not turn or rattle.

3. Each flush valve shall be furnished with a vacuum breaker providing one inch opening to atmosphere, which will not leak under any degree of back pressure and will not restrict rate of flow more than 10% at 10 PSI, and will operate noiselessly.

4. Tailpiece shall not be lighter than 17 gage and shall be part of flush valve assembly.

5. Exposed metal parts of flush valve assembly shall be nickel or chromium-plated on a brass or copper base.

6. Refer to 2.02.E for fixture supplies.

7. Controls for water closet flush valves shall be mounted on the wide side of toilet areas.

B. Schedule Numbers:

FLV-1: Automatic Flush Valve for Water Closets: Battery-powered, sensor-operated, 17 gage chrome-plated brass or heavier with cover and with metal cover manual override button. Shall deliver 1.28 gallon of water at each operation.

SLOAN	ZURN	OR EQUAL
Royal 111 SMO-1.28	ZER6000AV-HET-CPM	

FLV-2: Automatic Flush Valve for Urinals: Battery-powered, sensor-operated, automatic flush valve. Flush valve at 1/8 gallons per flush with manual override feature.

SLOAN	ZURN	OR EQUAL
Royal 186 SMO-0.125-DBP-OR	ZER6003AV-ULF-CPM	

2.16 FLOOR SINKS

A. Schedule Numbers:

FS-1: 6 inches to 8 inches deep, square cast iron acid-resistant enamel, bottom aluminum dome strainer with nickel bronze rim and grate top.

(To be specified for use in Multi-Purpose Buildings, High School Cafeteria and Mechanical Equipment Rooms.)

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
3140Y 3150Y	Z-1901 ZN-1900	FS-740-1 or FS-730-1	FS1720-1, FS1730-1	49320A-NB, 49340A-NB	

2.17 HOSE BIBBS

A. Schedule Numbers:

HB-1: For plaster or stucco wall, furnished with box and stop, exposed trim chrome-plated, with or without door and with vacuum breaker.

ACORN	WOODFORD	PRIER	OR EQUAL
8141, 8151	B75	C-633NFC	

HB-2: For brick, CMU and poured in place concrete walls, furnished with box and stop, exposed trim chrome-plated, with or without door and with vacuum breaker.

ACORN	WOODFORD	PRIER	OR EQUAL
8141, 8104, 8151	B75	C-633NFC	

2.18 LAVATORIES

A. Access compliant faucets for Lavatories: Force to activate controls shall be no greater than 5 pounds. Self-closing metering, when specified, to remain open 10 seconds minimum when activated.

B. Cast Iron Lavatories shall be acid resistant enamel and shall conform to Commercial Standards CS 77.63. Unites furnished in conjunction with strainer installation or faucet installation shall be brass. Exposed brass nuts shall be chrome plated.

C. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished.

D. Insulate cold water, hot water and drain lines under all access compliant lavatories with approved type insulation.

PLUMBEREX	LAV-GUARD	OR EQUAL

Schedule Numbers:

L-1: 20-inch by 18-inch cast iron, acid-resistant enamel punched with three holes, 4-inch on center and supplied with tempered or cold water only. Unit shall be furnished with cast iron hangers. Stops shall be loose key, square shank, lock shield type.

	COMMERCIAL ENAMEL	ZURN	KOHLER	OR EQUAL
Bowl	553 (3 holes)	Z5844	K-2867	
Faucet (See Section 2.13)	F-15	F-15	F-15	
Drain	Chicago 1-1/4-inch grid drain 327- XCP	Chicago 1-1/4 inch grid drain 327- XCP	Chicago 1-1/4-inch grid drain 327-XCP	OR EQUAL

2.21 PIPE HANGERS

A. Refer to Section 22 0513: Basic Plumbing Materials and Methods.

B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRU	UNISTRUT	TOLC O	B-LINE	OR EQUAL

2.22 P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

	AB&A		OR EQUAL
	107		

2.23 PRESSURE REGULATING VALVE ASSEMBLIES

A. Schedule Numbers:

PRV-1: Furnish for sizes ½-inch to 2-inch water service, all bronze body, stainless steel seat, bronze strainer, calibrated springs, and corrosion resistant, adjustable control.

WILKINS	WATTS	OR EQUAL
500XL- YSBR-HLR	LF223S-B-HP	

PRV-2: Furnish for sizes 2 ½-inch and larger: Automatic (pressure) control valve-pilot controlled and diaphragm actuated pressure control valve, straight or angle pattern, flanged inlet and outlet connection, fusion bonded epoxy coated inside and out with stainless steel cover, stainless steel pilot, stainless steel bolts and nuts, and stainless steel flexible tubing in a compact configuration, vandal resistant bolt-on pilot controller, ¼ ball valve on all pilot control lines, and stainless steel internal parts.

WATTS	CLA-VAL	OR EQUAL
LFM115	90-01	

2.24 ROOF DRAINS

A. Schedule Numbers:

RD-1: Low profile dura-coat cast iron body dome strainer type.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
1340Y-ERC-CID	EQUAL -	EQUAL -	EQUAL -	EQUAL	

OD-1A:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
1040Y-R-C-WD02 CID	EQUAL -	EQUAL -	EQUAL	EQUAL -	

2.25 SERVICE SINKS AND TRIM

A. Schedule Numbers:

SS-1: Cast iron, conforming to Commercial Standard CS 77.63 for acid-resistant enamel, 22-inch by 18-inch, with blank back, 2-inch outlet trap standard and rough-plated double faucet with top brace mounted above sink's back, furnished with vacuum breaker and hose end.

	AMERICAN STANDARD	CECO	KOHLER	ZURN OR EQUAL
Sink		867	K-6714-18	Z5880
Faucet	F-1 (See Article 2.13 – Faucets)	F-1	F-1	F-1
Trap Standard		870-2	K-6672	OR EQUAL

SS-2: Cast Iron corner service sink, conforming to Commercial Standard CS 77.63 for acid-resistant enamel, 28-inch by 28-inch, coated wire rim guard, 2-inch flat strainer and rough-plated double faucet with top brace mounted above sink back, furnished with vacuum breaker and hose end.

(To be specified for use in Custodial Rooms.)

	CECO	American Standard	KOHLER	CHICAGO	ZURN OR EQUAL
Sink	871		K-6710		Z5850
Faucet	F-1 (See Article 2.13 – Faucets)	F-1	F-1	F-1	F-1
Rim Guard	B-872		K-8940		RC
Strainer	B-71-2		K-9142		D-2

2.26 SINKS AND TRIM

A. For classrooms, offices and dining room sinks.

B. Access compliant faucets for sinks: Force to activate controls shall be no greater than 5 pounds. where specified self closing metering to remain open 10 seconds minimum when activated.

C. Cast iron sinks shall be acid resistant enamel, and shall conform to Commercial Standards CS 77.63. Units furnished in conjunction with strainer installation or faucet installation shall be brass. Exposed brass nuts shall be chrome-plated. Refer to the Fixture Supplies paragraph of this section.

D. Exposed trim shall be free from sharp edges or points. Fixture shall be furnished with other listed manufacturer specified trim. Instead of solid supply pipe, polished chrome-plated risers, 3/8-inches outside diameter with ferrule stop end and metal nosepiece may be furnished.

E. For access compliant sinks: Insulate cold water, hot water and drain pipes under sinks with district approved type insulation.

PLUMBEREX	LAV GUARD	OR EQUAL

F. Schedule Numbers:

ST-1: Cast Iron, 18-inch by 12-inch – 24-inch by 18-inch or 30-inch by 18-inch to select or as indicated on drawings, with basket strainer, hot and cold deck mounted faucet.

	KOHLER	AMERICAN STANDARD	CECO	HAWS	OR EQUAL
Sink			720C, 720G, 720I		
Faucet	F-12	F-12	F-12	F-12	
Strainer	K-8801	4331.013		6457	

ST-2: Same as ST-3, except with flat strainer and deck mounted faucet.

Strainer	KOHLER K-8807	CHICAGO	HAWS 6455	AMERICAN STANDARD 4311.023	OR EQUAL
Faucet	F-23	F-23	F-23	F-23	

ST-3: Cast Iron, 18-inch by 12-inch; 24-inch by 18-inch; or 30-inch by 18-inch or as indicated on drawings, with flat rim and center outlet. Single compartment, with basket strainer, hot and cold wall mounted CP faucet.

	KOHLER	AMERICAN STANDARD	CECO	HAWS	OR EQUAL
Sink			720-C, 720-G, 720-I		
Faucet	F-14	F-14	F-14	F-14	
Strainer	K-8801	4331.013		6457	

ST-4: Same as ST-3, except with wall mounted faucet and flat strainer.

KOHLER	AMERICAN STANDARD	ELKAY	OR EQUAL
Strainer: K-8807	4311.023	LK18	

ST-5: Same as SS-1 – (Service Sinks) 24-inch by 18-inch by 6-inch single compartment roll rim with back.

	AMERICAN STANDARD	CECO	KOHLER	ZURN	OR EQUAL
Sink		867	K-6714-18	Z5880	
Faucet	F-1 (See Article 2.13 – Faucets)	F-1	F-1	F-1	
Trap Standard		870-2	K-6672		

2.27 SEWAGE EJECTORS

A. Schedule Numbers:

SE-1: Duplex, (unless otherwise indicated) screen-less sewage ejector with two pumps and motors mounted on cover-plate and cover-plate shall be gas tight; furnished with automatic alternator, high water alarm, micro switch liquid level controller starters, fused disconnect switches and factory wired. Sump pit concrete is as specified in a related section.

WEIL PUMP CO.	LIBERTY PUMP CO.	Mc COOK PUMP CO.	HYDROMATIC PUMP	OR EQUAL

2. Motors: Drip-proof with electrical characteristics as scheduled on Drawings.

3. Controls: Weil Model 8230, or equal, mercury float switches, UL listed, two switches for high water alarms with cover mounting brackets. Control panels shall be NEMA 1, UL listed, and each contain following:

   a. Two cross-the-line magnetic starters.

   b. Two fusible disconnect switches.

   c. Two HOA switches.

d. Two running lights.

e. One 480/220 volt control circuit transformer.

f. One high water alarm relay.

g. One alternator.

h. One NEMA 1, 4-inch diameter alarm bell for mounting on control panel.

4. Basin Covers: Heavy steel covers, sizes as scheduled on drawings. Covers shall be duplex type with openings for pumps, manholes, and vent openings. Parts shall be gas-tight.

2.28 SERVICE STOP GAS VALVES

A. Schedule Numbers:

SGV-1: Bronze/Brass gas cock valve with double stake packing nut, ½ inch to 2-inch, with IPS, inclusive, with flat or square head. CSA approved.

AMERICAN	Mc DONALD	NIBCO	OR EQUAL
85 CBK or 86C	10596, flat 10604, square	GB2A	

SGV-2: Bronze/Brass, ¾-inches to 2-inch IPS (WOG) water, oil, or gas – full port ball valve. CSA approved.

WATTS	NIBCO	WILKINS	OR EQUAL
LFFBV-4	F-510-CS-R-66-FS	Model 850	

SGV-3: Lubricated plug gas valve, 3/4-inch to 2-inch IPS valve.

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786	1430	

SGV-4 : Lubricated plug gas valve flanged type 2 ½-inch and larger valve.

NORDSTROM	WALWORTH	RESUN	OR EQUAL
142	1786-F	1431	

SGV-5: Bronze/Brass ½ inch to 2-inch IPS X Flare Appliance ball valves with Tee handle. Flares to be used in conjunction with corrugated flex lines.

RED and WHITE	BRASSCRAFT	NIBCO	OR EQUAL
RW 5210 RW 5211 RW 5221	TBV 10-12 TBV 8-8 TBV 6-8	GBV 12 GBV 1516	

2.29 SUMP PUMP

A. Schedule Numbers:

SP-1: Duplex, centrifugal open type impeller and motor mounted cover plated, furnished complete with high water alarm, automatic alternator, float switch, enamel control panel, with starters, disconnect switches, pilot lights, factory wired, sump pit shall be concrete (or fiberglass) as specified in a related section.

WEIL PUMP CO.	PACIFIC PUMPING CO	Mc COOK PUMP CO.	HYDROMATIC PUMP	OR EQUAL
1600 Series				

2.30 STOP VALVES

A. Stops shall be loose key type, ½-inches IPS inlet and outlet chrome-plated brass casting, except as noted.

B. Schedule Numbers:

STV-1: Angle:

CHICAGO,	BRASSCRAFT	NIBCO	OR EQUAL
442-LKABCP		77	

STV-2: Partition:

CHICAGO	T& S BRASS	OR EQUAL
1771-ABCP	B-1028	

STV-3: Straight Type, with Loose Key:

CHICAGO	BRASSCRAFT	T&S BRASS	OR EQUAL
45-LKABCP (1/2 inch)		B-O418	

2.31 THERMOSTATIC MIXING VALVE ASSEMBLIES (MV-1)

A. General: Valve bodies shall be cast brass or bronze valve assembly provided with holding bracket and shall be installed on wall bracket. Valve shall be rough brass or bronze satin sprayed finish unless otherwise noted. Assembly shall include a 3 5/8-inch diameter dial thermometer, color-coded with white face and black letters. The temperature range between 100 degrees F. and l50 degrees F. shall be background in red or red line enclosed. Valve complete with fail safe feature, square shank loose key stops, checks and strainers on both hot and cold-water inlets and shutoff valve on outlet. Valves shall be sized on a 45 psig (maximum) pressure drop at the following flow rates:

TMVA-1: 5 to 15 GPM.

TMVA-2: 25 GPM.

B. Manufacturers:

POWERS	T & S	LEONARD	BRADLEY	WATTS	OR EQUAL
Type 430 Series Single Valve Hi-Lo (1430 series)	Ultra-Safe	Type TM	Navigator Series High/Low	LFMMV	

2.32 TRAP PRIMERS

A. Schedule Numbers:

ATP-1: Automatic, multi-trap primer, cast bronze with access panel. Pressure drop of three p.s.i. shall activate trap seal primers. Manufactured by MIFAB, or equal. (Installed in accessible location.)

MIFAB	OR EQUAL
MR-500-NPB	

2.33 URINALS

A. Schedule Numbers:

U-1: Urinal. Wall-hung vitreous china with replaceable trap integral liquid seal trap, provided with a biodegradable liquid seal in compliance with the Furnish complete with hanger brackets, fasteners, gaskets and drain line connections.

1. Fixtures shall comply with the following requirements:

a. Current versions of ASME A112.19.19, standard for Vitreous China Water Urinals and/or IAPMO IGC 161.

b. Shall meet performance, testing, and labeling requirements for American National Standards Institute (ANSI).

2. Manufacturers must have a current City of Los Angeles and LA County of Environmental Health and Safety MSDS approval prior to submittal.

a. Zurn Aqua Green Sealant.

b. Kohler Urinal Sealing Liquid.

U-1: Low flush urinal, 1/8 gallon. Wall-hung vitreous china, furnish complete with hanger brackets, fasteners, gaskets and ¾-inch top spud.

B. Bowl:

SLOAN	ZURN	OR EQUAL

C. Auto-flush valve (battery): FLV-2.

2.34 WATER CLOSETS

A. General: Water closets shall be vitreous china with Polyvinyl chloride bolt caps. Fixtures with auto-flush valves shall be provided with manual override button.

B. Schedule Numbers:

WC-1: Floor-mounted, 15 tinches height to top of seat for secondary school students and adult use, with flush valve at 1.28 gallons per flush and open front fire retardant white seats.

(Bowl:

AMERICAN STANDARD	KOHLER	SLOAN	ZURN	OR EQUAL
3451.001	K-96053	ST-2009	Z5655-BWL1	

a. Auto-flush valve (battery): FLV-1.

b. Seat: White, ring thickness including bumpers shall be one inch.

OLSONITE	BEMIS	CENTOCO	OR EQUAL
10SSCTFR	1955 SSFR	AMFR500STSCCSS	

WC-2: Floor mounted, access compliant, 17 to 19 inches height to top of seat with flush valve at 1.28 gallons per flush and open front, fire retardant seat.

a. Bowl:

AMERICAN STANDARD	KOHLER	SLOAN	ZURN	OR EQUAL
3461.001	K-96057	ST-2029	Z5665-BWL-1	

b. Auto-flush valve (battery): FLV-1.

c. Seat: White, ring thickness including bumpers shall be one inch.

OLSONITE	BEMIS	CENTOCO	OR EQUAL
10SSCTFR	1955 SSFR	AMFR500STSCCSS	

WC-3: Wall-hung, with 1.28 gallon/per flush, flush valve and open front fire retardant seat in white, less cover.

(To be specified for use when floor-mounted water closet piping interferes with flooring and inverted elevation is too critical to make connection. Specify Installation at appropriate height for application – see Section 2.47 "Height of Fixtures".)

a. Bowl:

AMERICAN STANDARD	KOHLER	SLOAN	ZURN	OR EQUAL
3351.101	K-4325	ST-2459	Z5615-BWL	

b. Auto-flush valve (battery): FLV-1.

c. Seat: White, ring thickness including bumpers shall be one inch.

OLSONITE	BEMIS	CENTOCO	OR EQUAL
1055CTFR	1955 SSFR	AMFR500STSCCSS	

2.35 WATER TEMPERATURE CONTROLLERS

A. Schedule Numbers:

WTC-1: Remote bulb type, plain steel case, baked enamel finish, glass fronted cover, mercury to mercury switch. 80 degrees F. to 240 degrees F. range of not more than 10 degrees F. differential.

MERCOID	HONEYWELL	JOHNSON CONTROLS	OR EQUAL
DA-4-35	T675A1540	A19 SERIES	

WTC-2: Immersion type, black hard steel case, separate well type, outside adjustment, temperature range 40 degrees to 180 degrees F. range of not more than 10 degrees F. differential.

HONEYWELL	PENN	JOHNSON CONTROLS	OR EQUAL
T-6031D 1007	A19ABC-11	A19 SERIES	

2.36 WATER HEATERS / DOMESTIC BOILERS

A. Gas fired or heat pump water heaters shall meet the Flammable Vapors Ignition Resistance requirements (FVIR).

B. Gas, heat pump or electric water heaters must meet NAECA energy efficiency requirements. Exceptions: Table top and point of use models (electric) less than 20 gallons. In capacity and gas models over 75,000 BTUH.

C. Water heaters from 75,000 BTU/hr to Boilers 2,000,000 BTU/hr shall comply with rule 1146.2 “Emission of Nitrogen from large water heaters and small boilers”. Natural gas fired water heaters with heat input rates less than 75,000 Btu/hr shall comply with rule 1121.

D. Schedule Numbers:

WH-1: Storage type water heaters shall be provided with a five year unconditional guarantee on tank heater and working parts. Complete guarantee for each heater shall be delivered to the Owner’s Authorized Representative (OAR).

a. Heater shall be furnished complete with baked enamel jacket, double density insulation, heating device, energy saver thermostat, drain valve is to be a ball valve with a plug in one end, and appurtenances necessary for satisfactory operation. Proper label of approval and manufacturer name, model number, size in gallons, and rated capacity shall be permanently secured to jacket.

b. Heater shall be furnished with a combination pressure temperature relief valve, installed in water heater tank.

c. Heaters, gas and electric, shall be certified by the California Energy Commission.

d. Floor-mounted heaters shall be on legs that are part of heater. Each heater shall be securely strapped to structure (with 2 straps per code).

e. Heat pump or Electric water heaters shall be UL tested, approved and listed. Heaters shall be furnished complete with baked enamel jacket, glass fiber insulation, heating element, double break snap acting thermostat, drain valve and appurtenances required for operation. Electric heaters shall be factory wired ready for connection to electrical source. Install a gate valve on inlet side and union on both inlet and outlet sides of heaters and combination pressure-temperature relief valve on discharge side. Flexible water piping connectors shall not be used.

f. Water heaters shall be of sizes indicated on Drawings and shall be furnished with equipment necessary to provide a complete and satisfactory piece of equipment.

g. Submit a complete list of boiler controls and appurtenances with wiring diagram, giving manufacturer's name, model number and, when applicable, size of each piece of equipment or appurtenance to be installed.

h. Pilot lines, gas valves, relays and their wiring shall be located outside boiler jacket to protect them from ambient temperature within. Flame safeguard relay shall be mounted on a control panel attached to wall at location indicated or as directed. All other controls and manual operators shall be so located as to be readily accessible when the boiler is in the installed position.

i. Wiring of water pump control circuit and line voltage supply to control panel is part of the Work of Division 23. All other wiring in connection with boilers is a part of the Work of this section. Wiring between boiler and wall-mounted control panel shall be installed 7 feet or more above floor level.

j. Gas-fired, storage type, size indicated on Drawings, with draft diverter and energy cut-off devices. Gas supply connections supplying less than 100,000 BTUs shall be with UL listed corrugated flexible appliance connector, and comply with ANSI Z21.24/CSA 6.10, Connectors for Gas Appliances. Connections supplying 100,000 BTUs and over shall be solid pipe. Heater shall be seismically secured with an approved restraint. HOLDRITE QS-50, QS-120.

Model No. as indicated on drawings or equal by:

Raypack	BOCK	RHEEM	A.O. SMITH	BRADFORD WHITE	OR EQUAL

2.37 WATER HAMMER ARRESTORS

WHA-1: Lead Free Water Hammer Arrestor provided for Headers for Lavatories, Wash Sinks, Wash Fountains, Kitchen Sinks, Service Sinks, Urinals and Water Closets. For sizing purposes size according to manufacturer's recommendations.

SIOUX CHIEF	PPP	JR SMITH	WATTS	JOSAM	OR EQUAL
655 and 656 SERIES	SC SERIES	5005 TO 5050 SERIES	Series LF05 and LF15M2	75000	

2.38 YARD BOXES

A. Schedule Numbers:

YB-1Yard Boxes: 14 3/4-inch by 20-inch by 12-inch, cast concrete, with cast iron hinged locking traffic cover marked "GAS"

(For use over gas stops for portable buildings only, on addition to accessible emergency shutoff valve on building.)

BROOKS No. 36-HFL Assembly with cast iron hinged locking cover	OR EQUAL

YB-2: Same as YB-1, marked "WATER" (For use over water valves).

BROOKS No. 36-HFL Assembly with cast iron hinged locking cover	OR EQUAL

YB-3: Same as YB-1, marked "SEWER”

BROOKS No. 36-HFL Assembly with cast iron hinged locking cover	OR EQUAL

2.39 FIXTURE CONNECTIONS

A. Branches to individual fixtures shall be of the following sizes (Inches) unless larger sizes are indicated on Drawings:

Fixture	Copper, Cold (Inches)	Copper, Hot (Inches)	Trap and Connections (Inches)	Soil/ Waste (Inches)	Vent (Inches)
WC Flush Valve	1	N/A	4	4	2
Lavatories	1/2	1/2	1-1/2 by 1-1/4	2	1-1/2
Service Sink	1/2	1/2	2	2	1-1/2
Kitchen Sink	1/2	1/2	1-1/2 by 1-1/2	2	1-1/2
Classroom Sink	3/8	3/8	1-1/2 by 1-1/2	2	1-1/2
Wash Sink	3/4	1/2	1-1/2 by 1-1/2	2	1-1/2
Multiple Drinking Fountains		N/A	1-1/2 by 1-1/2	2	1-1/2
Single Drinking Fountains	3/8	N/A	1-1/2	2	1-1/2
Individual Showers		1/2	2	2	2

Standard Urinals, Wall-Hung Flush Valve:		N/A	N/A	2	1-1/2
Access Compliant Urinals, Wall-Hung Flush Valve:		N/A	N/A	2	1-1/2
Sillcocks	3/4 minimum	N/A	N/A	N/A	N/A

B. Water headers serving water closets shall be copper water tube, with following size throughout length:

1. 1-1/2 inches for 2 flush valves.

2. 2 inches for 3 to 9 flush valves.

C. Water headers serving urinals shall be of following size throughout length:

1. 1” for 1 or 2 flush valves.

2. 1-1/4” for 3 flush valves.

3. 1-1/2” for 4 to 8 flush valves.

D. Water headers serving showers shall be same as listed above for urinals.

E. Water headers serving lavatories shall be of following size throughout length:

1. 1/2 inch for 2 lavatories.

2. 3/4 inch for 3 and 4 lavatories.

3. One inch for 5 and 6 lavatories.

4. Refer to 2.02.E for fixture supplies.

2.40 HEIGHT OF FIXTURES

A. Heights for standard fixtures.

Fixture	Height and Over (Inches)		
Toilets, height to top of seat	15		
Lavatories, sink top height	32		
Wash Sinks	30		
Urinals, lip height	24		

B. Heights for access compliant fixtures.

Fixture	Height		
Toilets, center line from wall/partition	17	Per CBC	
Toilets Seat Height	18	Per CBC	
Lavatories, sink top height	34 maximum	Per CBC	
Lavatories, sink knee clearance	27 minimum	Per CBC	
Urinals, lip height	16	Per CBC	
Urinals, flush handle height	43	Per CBC	
Drinking fountains, bubbler height.	36 maximum	Per CBC	
Drinking fountains, knee clearance	27 minimum	Per CBC	
Wash Sink	Per Drawings	Per CBC	

1.5 PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.

2. Install equipment as indicated on reviewed and accepted Shop Drawings.

3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.

B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.

C. For piping Work, refer to Section 22 0513: Basic Plumbing Materials and Methods.

D. Plumbing Fixture and Equipment Installation:

1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.

2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.

3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16 inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.

4. Pan type drinking fountains shall be hung with 5/16 inch cadmium plated bolts with a bolt in each bolt opening in hanger. Hangers for pan type drinking fountains shall provide 2 inches (plus or minus 1/4 inch) between pan and wall. Spaces due to irregularities between fixtures and tile walls shall be neatly filled with white cement or silicone filler.

5. Backing for hanging of plumbing fixtures and equipment shall be installed in supporting wall at time rough piping is installed. Backing for stud walls shall be steel plate 1/4 inch thick, not less than 4 inches wide. Backing for urinals shall be ¼-inches thick by 6-inch wide steel plate. Steel plate shall be attached to stud at each end of plate and to each stud it crosses. Plate shall be attached to metal studs by bolting with two ¼ inch U-bolts per stud with bolts through plate and around stud flange or by welding with a 1/8 inch fillet weld full width of stud flange, top and bottom of plate. At wood studs, plate shall be carefully recessed flush with face of stud and attached to each stud with 2 No. 14 flat-head wood screws, 2 inches in length into pre-drilled 1/8 inch holes. Backing for stud walls supporting wall-hung closets shall be as detailed.

6. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.

7. Piping shall be stubbed out to exact location of fixtures and stubs shall be installed symmetrical with fixtures. Hot and cold water supplies for center set faucets on lavatories shall be installed on 8-inch centers, unless otherwise specified or required.

8. Kitchen equipment requiring backflow protection with hot and cold water connections shall be installed with approved backflow prevention assemblies; BPV-3 and drain into floor sink with air gap.

E. Cleanouts in Drain, Waste, Vent and Sewer Lines:

1. Cleanouts shall be installed at locations stated in the California Plumbing Code and accessible at following locations:

a. At locations above first floor as stated on construction documents and 5 feet outside of the building.

b. Install an accessible main line upper terminal cleanout in all restrooms above water closet overflow. (Install above upper terminal water closet where there are more than one water closets in a restroom).

c. Above faucets of each sink with brass plug.

d. Above service sink with brass plug.

e. At each Drinking Fountain with brass plug.

f. At each urinal and locate above urinal with brass plug.

g. Above overflow level of pot sinks with brass plug.

h. In vertical line at base of each downspout connected to an underground storm drain system extend cleanout to exterior of building.

i. At upper end of a horizontal vent line when any part of horizontal line is below overflow level of fixture it serves.

j. Not to exceed 100-foot intervals in sewer and waste lines exterior of building.

k. At property line connection.

l. Where indicated on Drawings.

2. Cleanouts shall be extended to grade as follows:

a. Not to exceed 100-foot intervals in straight runs of pipe outside buildings.

b. At horizontal changes of direction in aggregate greater than 135 degrees (underground).

c. At property lines.

d. Where cleanouts occur under concrete.

e. Where marked for future connections.

3. Cleanouts in building shall be extended to floor level or above floor level or above floor level in walls or furring when cleanouts are not accessible or where clearance is less than 18 inches.

4. Cleanouts in finished areas in building shall be concealed except that cleanouts above service sinks in janitor's rooms or closet, and cleanouts above service sinks or in exposed piping in boiler or heater equipment rooms, may be exposed. Cleanouts for urinals shall be installed above urinal and shall terminate behind an access plate.

5. Cleanouts in floors of covered areas and those extended to grade in concrete areas shall be floor level type with extensions body brass plugs and detachable nickel-bronze or aluminum alloy scoriated.

6. Concealed cleanouts in vertical lines shall be service weight soil cleanout tees with brass plugs and round cover plates unless otherwise specified or indicated. A snug fitting sleeve of galvanized sheet metal shall be placed around hub of tee and shall extend to flush with finished soil, or cleanout shall be extended to finished wall.

7. Cleanouts extended from below floor to a wall or furring or on horizontal lines above floor that terminate at a wall or furring shall be iron body type with brass plugs and round cover plates.

8. Cover plates over cleanouts in painted walls shall be steel, bonderized and prime coated. Cover plates cover cleanouts in tile walls shall be chromium-plated brass or nickel bronze. Plates shall be attached to cleanout plugs with 5/16 inch No. 18 or 1/4 inch No. 20 stainless steel vandal-proof type screws. Plates shall be one inch larger in diameter than fitting opening.

9. Cleanouts at bases of downspouts shall be tapped soil tees with brass plugs as hereinafter specified, full size of line.

10. Cleanouts extended to grade in exterior sewer lines other than floors or concrete areas shall be a cleanout assembly with secured top, extra heavy-duty, adjustable sleeve, cut-off ferrule, countersunk threaded brass plug and scoriated tractor type cover.

11. Other cleanouts shall be iron body type.

12. Cleanout extensions shall be no-hub cast iron soil pipe. Exterior cleanouts, those in concrete excepted, shall terminate in a 14-inch by 6-inch thick concrete block with cleanout assembly and top of block flush with finish grade.

13. Fittings in lines utilized as cleanouts shall be approved soil fittings including no-hub pipe. Tees and crosses in vent headers excepted.

14. Pipe joint compound shall not be installed on cleanout plug. After lines are tested and approved, each cleanout plug shall be removed, greased, and replaced.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform trenching, excavation, and backfilling required for Work of this section as specified herein and in Section 31 2323: Excavating, Backfilling, and Compacting for Utilities.

3.04 SERVICE CONNECTIONS

A. Determine exact location of required water, drain, and sewer connections and provide proper connections.

B. Potable water lines shall be purged completely before connecting to sources of water for the Project. Determine quality of water supply before connection.

3.05 WATER HAMMER ARRESTORS

A. Install water hammer arrestors indicated on Drawings and in following locations (only non-ferrous arrestors may be installed in copper water system):

1. Water lines to lavatory headers, water closet and urinal headers, service sinks, kitchen sinks, wash fountains, drinking fountains, laboratories with medical type faucets and on wash sinks having three or more stations and all other quick closing fixture such as clothes washers, as close to fixture as possible.

2. Between last two fixtures when three or more fixtures, other than those listed in Number 1 above, are served by a common header.

B. When possible, arrestor shall be installed in wall or furring. When arrestor is installed in wall or furring, furnish an access plate large enough to permit removal of arrestor. Access plate shall be a minimum of 2 inches larger in each direction than the arrestor.

C. Fixture water lines shall be provided with mechanical water arrestor hammer dampening devices. Air chambers are not approved.

3.06 CONDENSATE DRAINS - FROM AIR CONDITIONING UNITS

A. Connect drain piping from drain pan of air conditioning unit to condensate disposal location indicated. When coil or unit housing is shock or vibration isolated, connection shall be furnished through a flexible connector not less than 10 inches long. Drain line shall pitch to flow out at not less than one inch in 8 feet. Drain line shall not be reduced smaller than unit outlet connection.

B. Condensate drain piping installed within building whether in air conditioned space or not shall be insulated. Refer to Section 22 0700: Plumbing Insulation, for type of material required.

C. Condensate Trap:

1. A condensate trap shall be installed for each air conditioning coil. Trap shall be assembled from 2 brass unions: one between A/C unit and inlet of trap, and one at outlet of trap that connects to main drain.

2. Trap configuration shall be per manufacturer's recommendations based on total unit casting static pressure (simulated plugged filter condition), but not less than 3 inch water seal.

3. Running trap design is not permitted.

4. Secondary drain shall not be trapped.

D. Condensate trap shall be checked at equipment operational tests for proper water drainage flow from air conditioning unit. Cooling condensate pan shall be filled with water, filters covered with plastic (plugged filter simulated), unit panels replaced, and unit motor running at design condition. Pan shall drain without hesitation to bottom of inlet connection. Tests are made prior to installation of ceiling.

E. Secondary Overflow Drain:

1. Drain pan installed underneath air conditioning units in concealed ceiling space or units that incorporate dam fitting shall be furnished with secondary drain piped to outside planter area with outflow location clearly visible.

2. If outside building location is not available or feasible, secondary drains shall be piped to a classroom sink, if sink is not available pipe to a room corner away from cabinets, computers, desks, door ways/entrances or stairs.

3. Secondary vertical pipe that penetrates through suspended ceiling shall be furnished with a coupling or threaded adapter so ceiling tile can be removed without damage.

3.07 CONDENSATE DRAINS - FROM WINDOW TYPE HEAT PUMP AND EXTERIOR WALL MOUNT HEAT PUMP UNITS

A. Whether indicated on Drawings or not, window units and wall mount units without built in bottom drain pan for evaporator and condenser coils shall be provided with galvanized steel condensate pan at bottom of unit with drain line that drains into approved drywell. Install copper 1/2 inch diameter pipe for window type air conditioners and 3/4 inch diameter pipe for exterior wall-mounted heat pump units.

3.08 MAKE-UP WATER SYSTEMS

A. Provide and connect make-up water systems for equipment in other sections.

3.09 GREASE TRAPS (INTERCEPTORS)

A. Grease traps shall be installed only when required by municipal authority. Grease traps shall be separately vented; fixtures connected to grease traps shall be trapped and vented. When grease traps are installed in concrete boxes, fill spaces between grease traps and concrete boxes with sand and place 2 inches of concrete seal over sand. Concrete seals shall pitch toward grease traps with inner edges flush with top of grease traps. Position openings for ease of cleanout.

3.10 GAS SERVICE

A. Above Grade Service: Pipe shall be steel, hammered, free of dirt and scale, and blown out with oil-free air or nitrogen to a clean, dry condition. Piping shall not be installed in or through a ventilation duct or plenum.

B. Underground Service, Gas approved (yellow) Polyethylene Plastic Pipe: Refer to Section 22 0513: “Basic Plumbing Materials and Methods”.

1. Pipes shall be joined with polyethylene fitting and joined together by thermal fusion in accordance with procedures recommended by Polyethylene plastic pipe and fitting manufacturer.

2. Plastic pipe shall be installed not less than 30 inches below grade.

3. Underground Warning Tape shall be installed 12 inches above buried gas piping. Warning tape shall be yellow with caution statement as follows:
“CAUTION – BURIED GAS LINE BELOW”.

4. Plastic pipe shall not be installed in or under a building or structure. Pipe shall be installed under bituminous surfacing or compacted soil area, free from large stones. Pipe may be installed under sidewalks or driveways, as long as no joint occurs. Pipe installed under paved covered areas wider than 40 feet shall be installed in ventilated conduits extending 2 feet past paving.

5. Pipe shall be installed on a 6 inches deep sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick.

6. Piping shall not support weight of valves, metal fittings or other items. Pipe shall be installed strain free.

7. Plastic pipe fittings shall not be stored or left exposed to sunlight. Pipe in open trenches shall be shielded. A sand envelope of 6 inches minimum shall be placed around pipe, with exception of joints, until inspection by IOR is completed. Protection for pipe shall be provided when necessary to leave pipe exposed overnight.

8. Installer of piping is required to have training and to have attained a certification. Non-trained/Non-certified installer must contact the manufacturer or manufacturer’s representative to provide on-site fusion training and certification, prior to work commencement

9. Polyethylene plastic pipe shall connect to a steel epoxy coated anodeless type riser to minimum of 6 inches above grade, when exiting the underground installation and transitioning to steel pipe connection.

10. Where a steel pipe riser passes into a structure or building, a double swing or double-offset joint shall be furnished. Pipe shall pass into structure 6-inches above grade and through a sleeve with a minimum one inch clearance. An isolation valve is required before pipe entering the building.

3.11 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.

B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height and shall be conspicuously posted at entrances to the Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.12 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

A. Newly installed or replaced piping and/or fixtures dispensing potable water, and any additional piping and/or equipment impacting the integrity of this system shall be disinfected and undergo an approved bacteriological analysis before water system is allowed for public use.

B. Disinfection shall commence upon complete installation of all related domestic water systems including fixtures, valves, faucets, water heating systems, etc.

C. Work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, and Article 2 Operator Certification Grades.

D. Method:

1. A Physical Separation of minimum 6” or Reduced Pressure Backflow assembly shall be installed to protect from cross contamination of the local water purveyor’s meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.

2. Install a Chlorination Port including a T fitting and a shut off valve to the proximity of the point of connection at the new piping system.

3. System is to be flushed to remove any materials that may have entered the system.

4. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.

E. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):

1. 24-hour Test Method:

a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, “Water System Being Chlorinated- “Danger Do Not Drink Water” or similar warning.

b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.

c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.

e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.

f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.

g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

h. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

2. 3 Hour Test Method:

a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the OAR's approval.

b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.

c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.

d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.

e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

f. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

F. Bacteriological Test:

1. After final flushing and satisfactory results from the residual free chlorine concentration test, Bacteriological test samples shall be collected. The intent of the following is to provide insurance for an accurate representation to a complete Bacteriological test of the water system. At least two samples shall be taken from each floor of each building.

2. Bacteriological test samples shall be delivered to a State of California Department of Health Services Certified Laboratory to perform qualitative and quantitative bacterial analyses on the water samples for the presence of any Total Coliform bacteria and Plate Count. This count must be less than 500 cfu/mL.

3. The procedure shall be repeated if it shown by bacteriological examination made by an approved agency that the level of Disinfection does not meet these specifications.

4. After satisfactory results for the bacteriological test are provided to the OAR, the physical barrier or temporary reduce pressure back flow devise shall be removed, and the new piping shall be connected to the point of connection. All the connecting piping and fittings shall be disinfected prior to installation. Chlorination Port shall be capped water tight. Warning sign or tags shall be removed.

G. Drinking Fountain and Bottle Filler Lead Test: After installation of Drinking Fountain or Bottle Filler, and successful Bacteriological Test, shut off domestic water supply line feeding the fixture, and inform OAR. OAR will coordinate with the Drinking Water Quality Program (DWQP) Supervisor in local Project Unit and M&O's Plumbing Technical Unit Supervisor to conduct lead detection test and mitigate as necessary. Do not remove related construction warning sign and tags.

3.13 VALVES ON PLUMBING SYSTEM

A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.

B. Hot and cold valves shall be:

1. Lead free complying with AB1953.

2. Above the ground copper water system, 2-inch and larger, may utilize Victaulic butterfly valves and fittings for their connections. A 2-inch or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.

C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked yard box to prevent tampering.

1. Immediately after each water meter, in addition to any valve furnished by utility company, there shall be an accessible valve on the inlet side for a strainer assembly, dual backflow device assembly and/or possibly a dual pressure reducing valve assembly.

2. A gate or ball valve on each water supply before it enters building. Valves shall be accessible from outside building and shall be installed in a marked yard box, unless otherwise indicated on drawings. Ball valves 2 ½-inch size or larger shall omit gate valve handle and furnish 2-inch square operating nut.

3. At multi story buildings, provide an isolation-valve or multiple valves for both hot and cold water in access panel to isolate and control each floor level.

4. For classrooms, shops, offices and boiler or mechanical room, install a gate or ball valve to control hot and cold water lines to each group of fixtures, a group of fixtures shall be considered to be 2 or more fixtures in the same room. When practical, valves shall be installed on the same wall as group of fixtures. Valves shall control only fixtures in rooms in which they are installed.

5. For restrooms, a gate or ball valve shall be installed in each restroom to isolate the hot and cold water supply into a restroom regardless of the number of fixtures. These valves shall control and be accessible only from within the restroom in which fixtures are installed. Valves shall be installed on the same wall as the group of fixtures it serves. Valves shall control only fixtures in restroom in which they are installed. Back to back restrooms shall be isolated separately and individually.

6. Install a gate or ball valve on each building branch line, which serves two or more fixtures, when these fixtures are not provided with a group isolation valve as specified above. These valves shall be located approximately 3 feet but not more than 7 feet above finish floor.

7. Install a gate, ball valve or partition stop for a drinking fountain or a group of drinking fountains.

8. Install a gate, ball valve or partition stop for hot and cold water supply to plumbing fixtures with no accessible supply stops, such as wall mounted faucets.

9. Install a gate, ball valve or partition stop for stops adjacent to, and controlling water flow to each sill cock and hose bib except as follows:

    a. A sill cock immediately below an exterior drinking fountain may be controlled by the same gate, ball valve or partition stop as drinking fountain.

    b. Valves or stops will not be required for individual hose bibs when these hose bibs are on a branch line serving only hose bibs and branch line is furnished with a shut-off valve.

10. Install a lose key angle stop, on each exposed fixture supply, and for each flush valve unless otherwise specified,

11. Install gate or ball valve at each location where a water line is connected to a piece of equipment other than items mentioned above.

12. Install a check valve on each hot water return line where it connects to a hot water storage tank or a water heater.

13. Handles, hand wheels (including dishwasher fill valve handles) and operating nuts shall be furnished of steel, brass, or cast iron and shall be removable. Unless specified to be loose key type, handles shall be securely fastened to their stems. On exposed outdoor valves, omit operating handles and provide operating nuts.

14. Provide a handle or a key for each five, or fraction thereof, loose key valves, bibs, or stops and deliver them to the project OAR.

3.14 VALVES - GAS SERVICE

A. A gas readily accessible shut-off stop shall be installed on each gas line entering a building immediately prior to the point it enters the building. Unless otherwise specified or indicated, shut-off valves for lines entering a permanent structure, buildings or portable buildings, shall be installed in a vertical riser above grade.

    1. Gas shut off valve for portable buildings – In addition to the gas readily accessible shut-off stop specified above, a dedicated Gas shut off valve shall be provided in a marked Yard Box, for each portable building to facilitate relocation/removal of building without the need to shut off gas to entire school.

B. Gas Shut off valve within a building – A gas shut off valve with handles shall be accessible and serviceable within an access panel. Install valve minimum 3 feet above floor but less than 7 feet above floor.

C. In addition to locations specified, gas shut off valve shall be installed at following locations:

1. Install a lubricated plug gas shut off valve on any line connected to gas main or header at master assembly.

2. Install a lubricated plug gas shut off valve before entering any building or structure.

3. Install a gas valve on each outlet, in addition to any gas stop furnished with equipment.

4. Service to laboratory gas cocks shall be furnished with a special precision check valve, located downstream from gas stop servicing room outlet at each laboratory cock. Unless otherwise specified, 1/8-inches bore shall be provided for each outlet cock.

5. Install a gas shut-off valve on each gas line serving 2 or more gas outlets in same room. Service stop shall be installed not more than 7 feet above floor, and shall be in the room it serves.

6. Install a gas shut-off valve on inlet side of each gas pressure regulating valve.

7. Gas shut-off valves to be furnished with equipment.

8. Install gas shut-off valve at not more than 1,000 foot intervals on each gas main.

9. At multi-story buildings, provide gas-shut off valve(s) to isolate and control each floor or level. Install valves in a concealed manner in walls with access panels.

10. Gas shut-off valves in classrooms and locations subject to tampering shall be protected while remaining accessible.

D. When a gas-shut off valve adjacent to gas-fired equipment is indicated in Contract Documents it shall be furnished and installed as part of Work of this section.

E. When electrical wall switches with emergency push button are specified for controlling gas outlets at Laboratory Classrooms, provide main shut-off gas valve with normally closed electric solenoid valve within an accessible access panel.

3.15 ELECTROLYSIS PREVENTION

A. Brass nipples, 6 inches, with recognized brass unions; flanges shall be furnished and installed at locations described herein. Flanges shall be installed with complete insulating component consisting of gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at following locations:

1. Where special applications indicated on Drawings require an insulation flange or brass union, with 6-inch brass nipple to be installed in a condensate line, or steam line, flange insulation shall be of a high temperature type, suitable for continuous operation at temperatures up to 220 degrees F. for condensate and 400 degrees F. for steam.

2. Where steel or cast iron in ground connects to copper or brass piping above ground, transition from steel or cast iron pipe to copper or brass pipe shall be provided in an accessible location.

3. Underground dielectric connections shall be furnished in accessible yard boxes.

4. Above ground dielectric connections shall be exposed; or if in finished rooms shall be located in accessible access boxes.

3.16 UNDERGROUND PIPE MARKERS

A. Pipe markers shall be furnished according to Section 22 0553: “Plumbing Identification”

B. Underground Caution Tape shall be placed 12 to 18 inches above the utility line. The Caution Tape shall be a designated color and marked with the appropriate name for the specific type of utility pipe as follows:

1. Yellow – with the words: CAUTION GAS LINE BELOW

2. Blue – with the words: CAUTION WATER LINE BELOW

3.17 HOT WATER CIRCULATING PUMPS

A. Floor-mounted pumps shall be provided with a 4-inch high concrete base with ½ inch reinforcing bars at 12-inch centers each way and doweled into concrete floor.

B. Piping shall be supported from building structure so as to prevent any strain on pump casing.

C. In-line pumps, unless otherwise specified, shall be centrifugal type with non-overloading characteristics and shall not overload motor above its horsepower rating under operating conditions with ratings based on continuous operation.

D. Centrifugal water pumps shall be rated according to Hydraulic Institute Test Code for Centrifugal Pumps. Pumps shall be furnished with bronze water chamber, bronze impeller and mechanical seal. Rotating parts shall be statically and dynamically balanced.

E. Flanged connections shall be provided on pumps with discharge connections larger than 2 inches. Smaller sizes may be threaded connections.

F. Hot water circulating pump shall be arranged so that pump can be automatically turned off when hot water system is not in operation.

3.18 WATER TEMPERATURE CONTROLLERS

A. Furnish and install a water temperature controller in hot water line adjacent to, and for control of, circulating pumps on hot water return lines when said pump is indicated on Drawings or herein specified. Bulb of temperature controller shall be installed so as to be directly in path of flowing water and so as not to obstruct flow of water.

B. Furnish and install a water temperature controller in hot water storage tanks for control of circulating pump on hot water circulating line when said pump is indicated on Drawings or specified herein.

3.19 DEPTH OF SEWER LINES

A. Minimum depth of below grade sewer lines shall be 24 inches to centerline of pipe. Sewer lines shall slope ¼ inch per foot minimum, unless otherwise indicated. Minimum depth at Owner property line shall be 6 feet, unless otherwise required.

3.20 BACKFLOW PREVENTION DEVICES

A. Backflow Devices: Installation of backflow devices shall be tested and certified by Los Angeles County backflow device tester before Substantial Completion. Tests shall be performed in presence of Project Inspector. Test reports shall be turned over to Project Inspector for mailing to proper agency.

3.21 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.22 PROTECTION

A. Protect Work of this section until Substantial Completion.

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DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 00 00

HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SCOPE: Work includes but is not necessarily limited to the following:

A. All applicable requirements of Documents 0 and Division 1 - General Requirements apply to the work of this Section.

B. Examine all other sections for work related to those sections which are required to be included as work of this section.

C. Section Includes: Heating, Ventilating and Air-Conditioning. Provide all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work in this Section. Complete, as shown on the Drawings and/or specified herein, including but not limited to these major items:

1. Split system air cooled heat pumps and exhaust fans.
2. Air distribution systems for air conditioning, ventilation and exhaust. Systems to be complete with access doors, dampers, diffusers, registers, grilles and all required accessories.
3. Hangers and support for ductwork and equipment.
4. Automatic control systems.
5. Thermal and acoustical insulation for plenums, piping, and ductwork.
6. Subzone systems.
7. Smoke detectors.
8. Air filters.
9. Vibration isolator.
10. Service and equipment connections.
11. Pipe hangers and supports.

12. Testing and balancing of systems.

13. Miscellaneous items including instruments, equipment supports, flashings, access panels, sleeves and plates, testing and adjusting, and all accessories and items required for a complete installation.

14. Permit and related fees.

D. Related Sections: Document affecting work of this Section include, but are not necessarily limited to general conditions, supplementary conditions and Sections in Division 1 of these Specifications.

1. Electric relays, switches and wiring for heating, ventilating and air conditioning equipment except where otherwise designated on control diagrams in Division 26 - Electrical.

2. Furnishing and installing control and starting equipment, including transformers and motor starters not furnished with equipment specified in Division 26 - Electrical.

3. Condensate drain lines, including connections to equipment in Division 22 - Plumbing.

4. Access Doors and Frames - Section 083116.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Without additional cost, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Conform to applicable City and State Building Codes and Ordinances.

1.3 GENERAL REQUIREMENTS - See Division 1

A. Location: Indicated on the drawings. For purpose of clarity, the drawings are generally diagrammatic, omitting offsets and small details. Certain duct runs are

shown distorted to avoid confusion. Where locations are fixed by dimension notations, follow as closely as possible consistently with proper installation.

B. Exact Locations: As required for proper installation avoiding interference with architectural and structural features, work of others to preserve head room and to keep openings and passageways clear. Make arrangement neat and occupy minimum space. Install each item of equipment so as to allow for ease of maintenance and in accordance with all governmental requirements having jurisdiction.

1. Locate ceiling diffusers symmetrical with respect to room center lines, electric lighting fixtures and acoustical tile. Arrange the exact locations in coordination with installation of lighting fixtures and acoustical tile; as indicated on the reflected ceiling plan on the drawings subject to the approval of the Architect.

C. Openings: Provide through walls, floors, partitions, and other construction as necessary for passage of ducts whether indicated or not on the Drawings. Seal around all penetrations.

D. Cutting and Repairing:

1. Cutting: Do not cut structural members without written authorization by the Architect.When permitted, provide all reinforcement with repair as directed by the Architect.Provide openings through walls, floors, partitions, and other construction as necessary for passage of pipes, conduit, and ducts whether or not such openings are shown on the Contract Drawings.

2. Repairing: By appropriate craft persons to restore construction to a condition approved by the Architect. Seal around all penetrations.

E. Protection of Work: As necessary to prevent damage of any kind to materials and installation.

F. Record Drawings: Provide accurately scaled locations, all control equipment, ducts, temperature control apparatus, volume dampers as installed, in strict accordance with provisions of Division 1 of these Specifications.

G. Submittal Shop Drawings, Manufacturer’s Data and Lists of Materials, Fixtures, Equipment and Control Diagrams:

1. General: Submit for approval, in accordance with provisions of Submittals Section of Division 1 of these Specifications, to ensure ample time for checking and processing of the submittals by the Architect; delays resulting from improper and untimely submittals shall be the responsibility of the Contractor.

2. Required List of Materials, Fixtures, and Equipment: Complete with names and addresses of manufacturer's, catalog numbers, trade numbers, trade names, illustrations, and descriptive literature for each article proposed to be used in this project. Descriptive literature to be sufficient for complete evaluation of equality of the proposed articles. All pertinent data for each article shall be underlined in each copy of each catalog or brochure in which it is described.

3. Required Control Diagrams: Complete ladder diagrams to show internal wiring of all major components and complete schematic control wiring diagrams, sequence of operation, and interlock of all associated equipment for each system to be drawn by Control manufacturer or A/C unit manufacturer and accompanied by a description of control sequence; to be submitted to be approved by the Architect before installation of any control wiring or equipment; without fulfillment of this requirement, control diagrams will not be approved.

4. Approval of shop drawing or other submittals will be general and shall not relieve the Contractor from the responsibility for proper fitting and construction of the work, nor from furnishing materials and work required by the Contract which may or may not be indicated on the shop drawings when approved as specified in Subsection 1.3(G) of this Section.

5. Disapprovals: Omit any article disapproved by the Architect not conforming to specifications or not of proper quality or grade and provide suitable article(s) in lieu thereof in conformity with the specifications. Start no construction work or purchasing related to such article(s) prior to approval.

6. Approved List: To be used for procurement without deviation, unless otherwise authorized by the Architect.

7. Modification of Contract Drawings: In each case where proposed substitute materials or equipment will require, for proper installation, changes to the design of the project as indicated on the Contract Drawings, appropriate proposed revision drawings shall be prepared by a licensed Architect or Engineer and shall be furnished by the Contractor for approval by the Architect. Letter of transmittal shall indicate all variations in performance, design, and installation between proposed substitutes and the specified items; each article in submittals will not be accepted unless identified with reference to Section and/or Subsection number of this Specification. Such drawings to be sufficiently complete for proper installation of the proposed substitute materials or equipment and for construction by all interested trades of the proposed revisions to the project. The cost of the drawings and of the proposed revised construction

shall be borne by the Contractor. Submit any proposed substitutions and any necessary deviations or changes to control diagrams to the Architect in accordance with Division 1. Contractor shall state in writing when such item is submitted as a “substituted item.”

H. Materials and Workmanship:

1. General: In conformity with City Plumbing and Mechanical Codes, Underwriters’ Laboratories, CAL/OSHA Standards, SMACNA Standards, State Energy Standards Title 24, and State Fire Marshall requirements.

2. Materials: New and in perfect condition. Materials for similar uses to be same type and manufacture unless otherwise approved; sheet iron or steel and fastenings to conform to requirements specified in the Division 1 of these Specifications. All heating and cooling equipment shall be listed items by California Energy Commission.

3. Workmanship: In accordance with best trade practices and as noted in Subsection 1.2A of this Section.

I. Permits and Inspections:

1. Permits: As required by Mechanical Codes; to be obtained and paid for by the Contractor except permits and costs otherwise provided for in these Specifications.

2. Inspections: Required of all installations prior to concealment and completion of the work; by the City Department of Building and Safety. Final Certificate of Approval required for the entire heating, ventilating, and air conditioning systems. See Division 1 for required permits.

J. Discrepancies or Errors: Should they appear in the drawings, specifications, approved shop drawings, or in other Contract documents, the Contractor as directed in Division 1, shall immediately notify the Architect and ask for instructions.

K. Maintenance and Operating Manuals: Provide maintenance and operating manuals for all equipment; include control diagrams with description of sequence of operation, as per provisions of Division 1 of these Specifications.

L. Acceptance of heating, ventilating, and air conditioning system will not be considered until the Contractor has completed balance, test and adjustment of all mechanical systems and all other work as hereinafter specified, including all testing work, and has demonstrated to the Architect that all such systems operate properly in accordance with these Specifications and the standards herein referenced.

M. Test and Supervision: As indicated in Division 1.

1.4 SUBMITTALS

A. Comply with provisions of Division 1.

B. Shop Drawings: Furnish detail shop drawings or catalog plates of all special equipment as required for approval. Shop drawings or catalog plates shall show sizes, sections and dimensions of equipment, methods of connection or attaching to work of other trades, and copies of all shall be furnished to other trades. Make all erection drawings necessary for the installation of the work.

C. Material List:

1. Before entering into any Contract for purchase of materials, and before any work is started, Contractor shall submit for approval, including catalogs and descriptive matter, of the following materials and equipment he proposes to furnish and install. Materials list shall be complete and contained in the hard-bound loose-leaf notebooks. Items not contained in the submittal shall conform to design specifications as supplemental submittals will not be accepted. Submittals shall include but not limited to the following:

    a. HVAC equipment.

    b. Ductwork and accessories.

    c. Each register, diffuser, and manufactured plenum with reference to schedule number.

    d. Wiring diagrams of electrical connections required for installation of equipment.

    e. Temperature control system with a detailed description of the control sequence, etc.

    f. Certified performance curves for all fans.

    g. Subzone systems.

    h. Smoke detectors.

    i. Air filters.

    j. Insulation.

k. Vibration isolators.

l. Seismic restraints.

m. Exhaust fans.

n. Air balance procedures and forms.

D. Wiring Diagrams: Wiring diagrams of work required for the installation of the ventilating and air conditioning equipment shall be submitted for approval. Only approved diagrams shall be used for installation purposes.

E. Tests and Balancing:

1. One week prior to final inspection submit to the Architect bound and indexed copies of the report on system operation, including air quantities at each outlet and fan, fan speeds, pulley and motor sizes, motor loads and all other pertinent data.

1.5 CODES, ORDINANCES AND CONDITIONS

A. All work shall conform to, and be installed in accordance with, the requirements of all laws, rules and regulations of the State, City, and County. Requirements of this Section are minimum requirements and shall govern, except that the building laws and/or the Drawings shall govern when their requirements are greater or more stringent, without added cost.

B. Where the work as shown on the Drawings or described in the Specifications is in conflict with any of the laws, ordinances or regulations applicable to this project, the Contractor shall notify the Architect and obtain directions before installing any of the work involved with the conflict.

C. Examine all other Sections for work related to those Sections and required to be included as work under this Section.

1.6 PRODUCT HANDLING: Comply with pertinent provisions of Division 1.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. Description: The sheet metal shall include housings, ductwork, plenums, dampers, equipment connections, etc.

B. Materials: Sheet metal shall be fabricated of galvanized steel sheets of lock forming quality (LFQ) and shall have a galvanized coating of 1-1/4 oz. total for both sides of 1 sq. ft. of a sheet. Supports not part of ducts, bar or angle reinforcing, damper rods and items made of uncoated mild steel shall be painted with two coats of primer.

C. Construction: Sheet metal ductwork may be of either rectangular construction (steel or aluminum) or round construction (only spiral seam steel). Gages as per local code requirements, minimum 26; fabrication shall be in accordance with the Sheet Metal and Air Conditioning National Association (SMACNA) HVAC Duct Construction Standards - Metal & Flexible, 3rd Edition - 2006, and as hereinafter specified.

D. Elbows and Tees: Shall have a center line radius of 1-1/2 times duct width, measured in plane of turn. All square elbows shall be equipped with turning vanes of double-thick metal of air foil design. Vanes shall be straight, and securely fastened to the sides. Square elbows with radius heel will not be permitted.

E. Extractors where Required for Proper Air Flow: Adjustable volume type with extended flexible shaft, connected to grille face or to side of duct permitting adjustment from exterior or duct.

F. Manually Operated Dampers or Splitters: Fabricated of 16 gauge steel, and as recommended by SMACNA Manual, equipped with Vent-Lock #637 self-locking regulator or equal on all ducts unless noted otherwise. Provide where required for air balancing, including O.S.A. intakes. Single leaf damper approved up to 36" x 12" maximum duct size, over these sizes multi-blade opposed type damper shall be used.

G. Joints and Seams Metal Ductwork: Seal all field joints and seams airtight with "Hardcast" or canvas and "Arabol" or approved equivalent. Ductwork exposed to weather shall have all joints sealed with canvas and "Arabol".

H. Kitchen Exhaust Ductwork: Ductwork shall be galvanized steel of 20 gauge. Duct shall be installed as per hood manufacturer’s instructions. Connections to hood shall be by this Contractor.

2.2 NOT USED.

2.3 REGISTERS AND GRILLES

A. All registers and grilles shall be furnished with finish as per architect. Extruded aluminum to be treated for painting unless otherwise specified or noted.

B. The manufacturer shall verify that all supply and return selections shall not produce an ambient noise level in excess of NC-30. Only the self-noise of the outlet shall be considered.

C. Shop drawings are required for each type register and manufactured plenums, with reference to schedule number.

D. All registers and grilles shall be furnished with neoprene gaskets.

E. Grille and Diffuser by: Titus, Krueger, Anemostat, Metalaire.

F. Description: As per schedule on Drawings, sheet M007.

2.4 ACOUSTICAL AND THERMAL LINED DUCTS

A. Material: 1" thick flexible glass fiber, 1-1/2 lbs. per cu. ft. density, blanket type duct liner. Lining must be approved by local codes and shall be approved by local codes and shall meet or exceed NFPA Standards. NRC rating shall be at least .080 at frequencies above 1000. R-6.0 minimum.

B. Manufacturers: Johns Manville ’Line-Coustic A’ duct liner, Owens-Corning ‘Aeroflex’ or approved equivalent.

2.5 THERMAL INSULATION, WRAPPED (DUCTWORK)

A. Material: Glass fiber blanket of not less than 1-1/2 lb. Per cu. ft. density. 2" thick on return and supply ducts. Duct insulation to be provided with foil face vapor barrier. R-6.0 minimum indoors.

B. Manufacturers: Manville ‘Microlite’, equivalent by Owens-Corning or approved equivalent.

2.6 VIBRATION AND NOISE CONTROL

A. All mechanical equipment shall be isolated from the structure by means of resilient vibration and noise isolators, supplied by a single manufacturer to the mechanical contractor.

B. Earthquake Restraints: All base mounted equipment shall be equipped with seismic snubbers. Snubbers shall be capable of withstanding a horizontal force equal to 1 g., and a vertical force equal to ½ g.

2.7 EXHAUST FANS

A. Ceiling or Wall Exhaust Fans:

1. Package ceiling or wall mounted centrifugal fan complete with motor, sound insulation, housing, pre-wired outlet, box, vibration isolators and backdraft dampers. Provide roof jacks or roof caps as required.

2. Capacities as scheduled on Drawings, maximum 2.0 sone for toilets. Maximum 3.5 sone for utility areas.

3. Manufacturer: Panasonic, Air King, Cook or approved equivalent.

2.8 SPLIT SYSTEM HEAT PUMP HVAC UNITS

A. Outdoor Heat Pump:

1. Contractor shall provide air-to-air electric, R-410A “Puron,” heat pumps with built-in outdoor coil and compressor sections. Capacities shall be as required to maintain design conditions. Factory installed coil refrigerant metering device shall be mounted on liquid service valve and reversing valve. Condenser fans shall be direct-driven and arranged for horizontal air discharge. Fan motor shall be factory lubricated, inherently protected and resiliently mounted.

2. Compressor shall be hermetically sealed scroll type with internal vibration isolators and provided with sound attenuating device. Compressor motor shall include all thermal and current-sensitive overloading devices. Compressor shall be equipped with a crankcase heater and shall have internal high-pressure protection. Controls shall be factory wired in a readily accessible location.

3. Controls shall include a liquid line low pressure switch, suction line accumulator and pressure relief device. Control wiring terminal board shall be designed to match indoor unit terminal board and accessory automatic changeover thermostat terminals for standardized point-to-point connection.

4. S.E.E.R. & H.S.P.F. must comply with Title 24 requirements. See equipment schedule.

5. Accessories shall include automatic changeover thermostat, solid-state time guard, liquid line Biflow filter-dryer and solenoid and refrigerant tubing length as required. Where required, provide manufacturers stacking kits.

6. Manufacturer: Carrier Alternate manufacturers for equal capacities, weights and electrical characteristics shall be preapproved.

B. Indoor Fan Coil Unit:

1. Contractor shall provide direct expansion R-410A “Puron” heat pump fan coil units equipped with check and expansion valve kit, as shown located on floor plans and schedule. Unit shall be horizontal discharge type. Unit enclosure shall be insulated and constructed of galvanized steel, bonderized and finished with baked enamel. Service access panels shall provide access to all components. Filter rack shall be equipped with 1" thick Farr disposable MERV 8 filters that slide out for maintenance.

2. Fan shall be forward curved with double inlet, mounted on motor shaft, dynamically and statically balanced. Cooling coil shall be non-ferrous with aluminum plate fins. Coil shall have factory-installed refrigerant metering device, refrigerant line fittings which permit mechanical connections; and condensate pan with primary and secondary drain connections as well as an emergency float switch.

3. Accessories: As scheduled on drawings.

4. Manufacturer: Carrier. Alternate manufacturers for equivalent capacities, weights and electrical characteristics shall be preapproved equivalent.

2.9 REFRIGERANT PIPING AND ACCESSORIES

A. All refrigerant piping shall be Type "L" copper.

B. Refrigerant piping shall be made up of wrought copper or forged brass designed for refrigerant piping and for use with "Silfos" high-temperature solder. No joints are allowed in inaccessible locations.

C. Hangers on insulated refrigerant piping shall fit outside covering. Provide covering protection saddle 10" long at each hanger. Rigid insulation shall be provided at all hangers to prevent crushing.

D. Provide Semco trisolators at all hangers of uninsulated piping.

E. Provide vibration eliminators with braze-welded female ends, approved for refrigeration piping.

F. Drier: Sporlan silica gel replaceable core sized for compressor capacity with bi-flow for heat pump duty, approved equivalent Henry or Alco.

G. Liquid indicators double ported installed in lines at cooling coil inlets. Manufacturer: Henry or Alco.

H. Shut-off valves shall be balanced action packless type for lines sized 1-1/8" O.C., or smaller, and wing cap packed bronze valves with bolted bonnets, repackable under pressure by Henry.

I. Expansion Valves: Pilot operated piston type with manual operation stem by Henry or Alco.

J. Solenoid valves shall be Henry or Alco.

K. Installation: Dehydrate complete system and test thoroughly for leaks before initial charge is placed in system. Special care shall be taken for abnormally long piping runs in excess of 50 feet. Consult manufacturer of A/C equipment for installation requirements and restrictions.

L. Refrigerant and Oil: Contractor shall furnish and charge the system with the necessary charge of refrigerant, together with all the oil necessary to operate the system. Sufficient refrigerant shall be supplied to fill the system for proper operation.

M. Guarantee: Replace at no cost to the Owner all refrigerant and oil lost due to leaks or faulty materials and workmanship for a period of one year after date of acceptance.

N. Insulate suction lines including fittings, with "Rubatex" flexible elastomeric tube insulation. Seal all seams and joints with Rubatex 373 adhesive, 0.25 "K" value maximum. 3/4" thick on pipe 1-1/2" and smaller. Provide UV protective coating on insulation exposed to atmosphere.

2.10 AIR FILTERS

A. A. MERV 13 Efficient - Medium efficiency pleated disposable type, size as required by air handling unit. Filters shall be provided with media support grid, enclosing frame. Filter shall be FARR Air UL, Class 2 (30/30) or approved equivalent.

B. Replacement Filters: All systems shall have specified filters installed prior to testing and balancing: All filters shall be replaced at the time the building is turned over to the Owner.

2.11 THERMOSTATS

A. Shall be remote, microelectronic chronotherm heating/cooling type with separate temperature sensing elements for each system. Heating and cooling circuits shall be electrically isolated from each other. The heating side shall be provided with a factory set maximum of 75 degrees F. The thermostat shall contain or be provided with sub-base containing selector switches for cool-off heat and fan-auto-on.

B. Low voltage digital clock type with programmable set points for automatic operation, one or more times per day.

C. Manufacturer: Honeywell or approved equivalent.

2.12 ELECTRICAL MOTORS

A. General: Motors rated less than ½ HP shall be wound for 115 or 240 volt, 60 hertz, single- phase current. Motors rated ½ HP and over shall be wound for 240 volt, 60 hertz, 3-phase current, unless noted otherwise. If exposed to weather or moist atmosphere, all enclosures shall be drip-proof and epoxy encapsulated unless otherwise specified.

Single Phase Motors: NEMA Standard for fractional HP motors. Built-in overload and low- voltage protection with reset button on motor is required.

2.13 AUTOMATIC CONTROL DEVICES

A. Furnish all the automatic temperature control devices.

B. The control equipment shall be as indicated on drawings.

1. Instruct the electrician, or sheet metal worker on the particular requirements of the control devices for which each is responsible.

2. Calibrate all devices and make all final settings and test out the control system under actual operating conditions for satisfactory operation.

C. Wiring: All line voltage conduit and wiring in connection with the control system is specified under "Electrical" Section.

D. Thermostats: Low-voltage electric type and self-generating multivolt room thermostats complete with set point adjustment. Mount 4'-0" above floor.

1. See control diagram on drawings for fan controls.

E. MACHINERY GUARDS

F. Cover all moving parts of machinery such as shaft couplings, belt drives, exposed fan intakes, etc., with removable metal guards. Provide access in guard for tachometer readings. Comply with applicable safety regulations.

PART 3 – EXECUTION

3.1 STEEL SHEET METAL WORK

A. Sizes shall be as noted on Drawings, to provide quiet draft-free ventilation.

B. Slope: No more than 1 to 7 on any side except where connections dictate. A maximum of 1 to4 may be used, subject to approval.

C. Throat: Area of the branch duct takeoff shall be in direct proportion to the volume of air to each branch.

D. Holes: Holes in duct for damper rods and other necessary devices shall be drilled and shall be airtight. No pipes, conduits or other member may pass through any duct unless otherwise shown on the Drawings.

E. Noise: Entire system shall prove quiet to a degree satisfactory to the Owner. Any adjustment required to produce quietness shall be made by the Contractor before work can be deemed to be finished and accepted.

F. Isolation: Where incompatible materials come in contact, they shall be isolated from each other with rubber, neoprene, lead or material best suited for the materials to be isolated.

G. Supports: Secure ducts against displacement and vibration. Anchor to structural parts of the buildings at intervals not greater than 10 feet. Suspend with 18 gauge straps and as recommended in the SMACNA Manual.

3.2 INSTALLATION OF DUCTWORK

A. Fabricate and install ductwork in strict accordance with Mechanical Code Chapter 6, and SMACNA standard.

B. Sheet Metal Ductwork:

1. Cross-break, or kink flat surfaces to prevent vibration.

2. Wherever obstructions require a change in duct shape, maintain equivalent areas. Sizes indicated on Drawings are sheet metal sizes allowing for the lining.

3. Connections:

    a. Install and make necessary connections for the complete supply, recirculation and exhaust systems including ductwork, air distribution device, collars, intake housings, hangers, connections, fasteners, and other items required.

    b. All air supply and return air ducts shall have their longitudinal and transverse seams tightly sealed to provide an airtight system.

C. Provide flexible canvas connections between units and ductwork, minimum 3" wide.

D. Volume Dampers:

1. Provide adjustable volume dampers in branch supply and return ducts.

2. Locate the dampers as close as possible to the main duct.

3. Provide remote operators where dampers are inaccessible.

E. Debris Protection: Prior to any interior sanding or finishing of the Apartments, provide covers for all duct inlets and outlets to prevent any debris, dust or paint from inadvertently getting into the duct system. If the systems are to be in operation during the construction, provide temporary extra high-quality filters on the systems. Remove these filters at the time of Testing & Balancing and turn them over to the Owner. Also provide protection for the HVAC equipment that is on site during the construction period.

F. All ductwork, equipment and appurtenances handling air at temperatures above or below room ambient shall be insulated as generally described herein.

G. Installation shall be neat and workmanlike in appearance and quality of workmanship.Insulation shall be neatly cut at supports, etc., and shall be first class in workmanship. Installation shall be in direct compliance with manufacturer’s recommendations for his particular materials. Care shall be taken during installation to eliminate or reduce dust and dirt to a minimum. Waste and debris shall be removed as it accumulates.

H. Where ducts are lined on the interior, no external insulation is required.

3.3 INSTALLATION OF DUCTWORK

A. Fabricate and install ductwork in strict accordance with Mechanical Code Chapter 6, and SMACNA standard.

B. Sheet Metal Ductwork:

1. Cross-break, or kink flat surfaces to prevent vibration.

2. Wherever obstructions require a change in duct shape, maintain equivalent areas. Sizes indicated on Drawings are sheet metal sizes allowing for the lining.

3. Connections:

a. Install and make necessary connections for the complete supply, recirculation and exhaust systems including ductwork, air distribution device, collars, intake housings, hangers, connections, fasteners, and other items required.

b. All air supply and return air ducts shall have their longitudinal and transverse seams tightly sealed to provide an airtight system.

C. Provide flexible canvas connections between units and ductwork, minimum 3" wide.

D. Volume Dampers:

1. Provide adjustable volume dampers in branch supply and return ducts.

2. Locate the dampers as close as possible to the main duct.

3. Provide remote operators where dampers are inaccessible.

E. Debris Protection: Prior to any interior sanding or finishing of the Apartments, provide covers for all duct inlets and outlets to prevent any debris, dust or paint from inadvertently getting into the duct system. If the systems are to be in operation during the construction, provide temporary extra high-quality filters on the systems. Remove these filters at the time of Testing & Balancing and turn them over to the Owner. Also provide protection for the HVAC equipment that is on site during the construction period.

3.4 NOT USED

3.5 NOT USED

3.6 ELECTRICAL WORK

A. Disconnect switches, line voltage wiring and all conduit (power line and low voltage) are specified in the Electrical Section of the Specifications unless otherwise specified and/or noted on Drawings.

Wiring diagrams of electrical connections required for the installation of equipment of this Section shall be submitted to the Owner for approval. After approval, the wiring diagrams shall be submitted to the Electrical Contractor for use in installation.

3.7 PAINTING

A. Painting of all apparatus, unless hereinbefore specified, shall be done under the Painting Section of the Specifications. All apparatus furnished by the Contractor shall be provided with a shop coat at the factory. Inside of ducts behind all air inlets and outlets in finished areas shall be painted two coats of dull flat black by this Contractor. Certified low V.O.C. rating.

3.8 EQUIPMENT IDENTIFICATION

A. Identify all equipment, using brass discs or black with white engraved letters laminated plastic. Install in readily visible location, not interfering with insulation.

B. Fans, Air Conditioning Units, Pumps, Etc.: Laminated plastic showing manufacturer, HP, capacity, static pressure and electrical characteristics.

3.9 TESTING AND BALANCING

A. General:

1. Test, balance and adjust the ventilating systems as specified herein. All work shall be done under direct supervision of a qualified engineer or contractor. All instruments used shall be under direct supervision of a qualified engineer or contractor. All instruments used shall be accurately calibrated and maintained in good working order.

2. Balancing and testing shall not begin until systems have been completed and are in full working order. Put all ventilating systems and equipment into full operation during each working day of testing and balancing.

3. Perform the following tests, compile the test data and submit 2 copies of the complete test data to the Owner.

B. Air Testing Procedure: Perform the following tests and balance system, including air distribution devices provided by the ceiling Contractor, in accordance with the following requirements, but not limited to:

C. Test and adjust blower RPM to design requirements

D. Test and record motor full load amperes.

E. Make pitot tube traverse of main ducts and obtain design CFM at fans.

F. Test and record system static pressures, suction and discharge.

G. Test and adjust system for design recirculated air, CFM and temperature.

H. Adjust all main supply and exhaust air ducts to proper design CFM.

I. Test and adjust each grille and register to design CFM requirements.

J. Manufacturer's ratings on all equipment shall be used to make required calculations.

K. Readings and tests of grilles and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.

L. Make any changes in the pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by the air balance agency, at no additional cost to the owner.

M. Upon completion of the balance of the system, all the information shall be inserted on a sheet listing all items required by Specifications and be included in complete test and balance report and then shall be submitted for approval.

N. The Owner reserves the right to request the Contractor to readjust air volume and different systems requirements to meet local conditions during the six months following, after completion of the total balancing of the systems. During this time, the Engineer, at his discretion, may request a recheck or resetting of any outlet, supply air fan, or exhaust fan or any other equipment or part of as listed in the

test report. Contractor shall provide technicians to assist the Engineer in making any tests he may require during this period of time.

3.10 CLEANING

A. Completely cover motors and other moving machinery to protect from dirt and water during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.

B. Thoroughly clean inside of ductwork before installing grilles.

C. During process of work, premises shall be kept reasonably free of all debris, cuttings, and waste material resulting from work under this heading. All debris, rubbish, leftover materials, tools and equipment shall be removed from the site prior to final acceptance.

D. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.

E. Damaged factory applied finishes shall be "touched up". "Touch up" shall be accomplished with preparation, prime and finish coats applied in strict accordance with the manufacturer's recommendations.

3.11 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Complete sets of instructions containing the manufacturer's operating and maintenance instruction for each piece of equipment shall be furnished in accordance with the general requirements to the Engineer. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers; the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor and the contract number.

The Contractor shall incorporate, among others in the sets of operating and maintenance instructions to the Owner's representative, the following directions:

1. Part numbers of all replaceable parts.

2. Manufacturer's cuts and rating tables.

3. Oiling, lubricating and greasing data.

4. Complete electrical load data from operation tests.

5. Air flow data on all fans indicated on the Drawings.

6. Serial numbers of all principal pieces of equipment.

7. Installing companies' names, addresses and telephone numbers.

8. Control diagrams and operating sequences together with labeling of control wiring and instruments to match diagrams.

After approval by the Owner, three (3) copies of this instruction and maintenance manual shall be furnished to the Owner's representative.

3.12 TEMPERATURE CONTROL SYSTEM SEQUENCE

The Contractor shall be responsible for furnishing all the automatic temperature control devices.

A. Submit a shop drawing of the proposed temperature controls, and detailed description of the control sequence.

B. Instruct the electrician, sheet metal worker or other specialist on the particular requirements of the control devices of which each is responsible.

C. Calibrate all devices and make all final settings and test out the control system under actual operating conditions for satisfactory operation.

D. Wiring: All line voltage conduit and wiring as well as low voltage conduit in connection with the control system shall be provided under the Electrical Section of the specifications.

3.13 INSTRUCTION TO PERSONNEL

A. Upon completion of the installation of the equipment, place a competent person in charge to operate the different systems and instruct the Owner's representative in all details of operation and maintenance. Any required instructions from manufacturer's representative shall be given during this period.

B. The Contractor shall incorporate, among others in the set of operating and maintenance instructions to the Owner, the following directions:

1. Clean and replace fan belts every two months for the first six months.

2. Oil motor bearings every two months (give manufacturer's recommendations and type of oil) unless permanent lubricant bearings.

3. Check and replace filters as required for proper performance. Replace air filters at completion of construction and provide two (2) extra sets to owner.

4. Oiling, lubricating and greasing data.

5. Belt sizes, type and lengths.

6. Serial numbers of all principal pieces of equipment.

7. Installing company's names, address and telephone numbers.

8. Control diagrams.

C. After approval by the Architect, two (2) copies of this instruction and maintenance manual shall be furnished to the Owner's representative.

3.14 GUARANTEE

A. In addition to other guarantees required and as a condition precedent to the issuing of the final certificate for completion payment, the Contractor shall deliver to the Architect a written guarantee that all materials, apparatus and equipment furnished and installed hereunder shall be new and free from all defects. Should any trouble develop within one (1) year from date of acceptance of the building, due to faulty or inferior material and/or workmanship, the trouble shall be corrected by the Contractor without expense to the Owner. The Contractor shall guarantee all apparatus and equipment to deliver the capacities as scheduled and/or specified.

3.15 DESCRIPTIVE NAMES

A. Selected Manufacturers: Where the name of a selected manufacturer of equipment, fixtures, or material is specified, the proposal of the Contractor shall be based on the use of the named product or equivalent product of manufacturers if such are listed. No substitutions will be permitted.

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SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section provides the basic mechanical requirements that apply to the Work of Division 23.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 26: Electrical.

1.2 REGULATORY REQUIREMENTS

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. AMCA- Air Movement and Control Association.
2. ANSI - American National Standards Institute.
3. ASME - American Society of Mechanical Engineers.
    a. ASME Boiler and Pressure Vessel Code.
    b. ASME B31 - Code for Pressure Piping.
4. AHRI - Air-Conditioning, Heating, and Refrigeration Institute.
5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.
6. ASTM - American Society for Testing and Materials.
    a. ASTM A53 - Specification for Welded and Seamless Pipe.

7. CSA - Canadian Standards Association.

8. FM Global - Factory Mutual Global

9. IAPMO - International Association of Plumbing and Mechanical Officials.

10. NFPA - National Fire Protection Association.

11. OSHA - Occupational Safety and Health Administration.

12. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

13. UL - Underwriters Laboratories Inc.

14. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Mechanical Code.

   a. Latest edition as adopted by the City of Los Angeles, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3. OSHA - Occupational Safety and Health Administration.

4. CDPH – California Department of Public Health.

5. SCAQMD - South Coast Air Quality Management District.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.3 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 23 sections, as applicable.

B. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.4 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of mechanical and control system drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full-size reproducible plots on vellum and three sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

   a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

   b. Manufacturer's operating instructions including, but not limited to, the following:

      1) Identification of components and controls.

      2) Pre-start checklist and start-up procedures.

      3) Normal operation settings and checklists.

      4) Pre-shut down checklist and shut down procedures.

      5) Trouble shooting checklist and guidelines.

      6) Recommendations for optimum performance.

      7) Warnings and safety precautions on improper or hazardous operational procedures or conditions

   c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 23 that includes the following as a minimum:

      1) Manufacturer’s model, identification and serial numbers.

      2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

      3) Directory of manufacturer’s representatives, service contractors and part distributors.

      4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

   d. Project Record Drawings: Complete set of mechanical and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

   e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 01 4525.

f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.

g. Los Angeles County industrial waste permits.

h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.5 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 23. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.7 PRELIMINARY OPERATION

A. OAR may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the Project Inspector at least 24 hours in advance of lighting or re-lighting pilots.

1.8 TRAINING OF OWNER PERSONNEL

A. Training of Owner’s personnel shall include:

1. A minimum of 8 hours of on-site overview of the overall Mechanical System.

2. Refer to Division 23 sections for specific training on each of the components of the Mechanical System.

3. A minimum of 8 hours of on-site overview identifying location and function of all Control Valves and Actuator assemblies.

4. A minimum of 40 hours of (in classroom) software training for a minimum of 20 LAUSD personnel on EMS/BMS if such systems are utilized in the project. Training shall be conducted at control contractor training facility with computer setup for each person attending.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.9 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in

Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.

D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

E. For substitution of materials or products, refer to the General Conditions.

PART 3 - EXECUTION

3.1 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.2 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes or ducts pass through, or are located within one inch of any construction element, install a resilient pad, 1/2 inch thick minimum, to prevent contact.

C. Furnish all necessary provisions for recesses, chases, and accesses and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.3 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.4 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 23, including this Section.

B. Tests required by other sections of the Contract Documents include the following:

1. Test and balance of mechanical equipment and systems: Refer to Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

2. Hydrostatic test of boilers: Refer to Section 01 4525: Testing, Adjusting, and Balancing.

3. Test of smoke and fire detectors: Refer to Division 26: Electrical.

C. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

D. Piping Tests:

1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Project Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gages furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.

7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Project Inspector.

8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

System Tested	**Test Pressure (psig)**	**Test With:**
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Refrigeration piping		
R-410a	600	Dry nitrogen

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

    a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

G. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Paragraph 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.

4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.

5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.

3.5 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.6 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.

5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.

6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.

7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

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SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section " Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
3. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.

11. PHD Manufacturing, Inc.

12. PHS Industries, Inc.

13. Piping Technology & Products, Inc.

14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.

2. ERICO/Michigan Hanger Co.; ERISTRUT Div.

3. GS Metals Corp.

4. Power-Strut Div.; Tyco International, Ltd.

5. Thomas & Betts Corporation.

6. Tolco Inc.

7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter 3erson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a) Hilti, Inc.

b) ITW Ramset/Red Head.

c) MasterSet Fastening Systems, Inc.

d) MKT Fastening, LLC.

e) Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a) B-Line Systems, Inc.; a division of Cooper Industries.

b) Empire Industries, Inc.

c) Hilti, Inc.

d) ITW Ramset/Red Head.

e) MKT Fastening, LLC.

f) Powers Fasteners.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstinging, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in DSA approved drawings. It shall be per approved drawings.

B. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

C. Building Attachments: Shall be per DSA approved drawings:

3.2 EQUIPMENT SUPPORTS

A. Factory fabricated roof curbs.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches

3.5 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as

used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

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SECTION 23 05 48

HVAC SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.

1. Vibration isolators.
2. Seismic restraint devices.
3. Flexible ducts, conduits and piping.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 0593: Testing, Adjusting, and Balancing for HVAC.
3. Section 23 0500: Common Work Results for HVAC.
4. Section 23 3000: Air Distribution.
5. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.2 GENERAL REQUIREMENTS

A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building and mitigate vibration frequency and load imposed by equipment. Vibration isolators, base frames, inertia bases and seismic restraints shall be of sufficient size, flexibility and load distribution configuration to assure that deflection, stability and seismic restraint requirements are met without permitting excessive movement when starting. For typical units, no fewer than four isolators shall be provided. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within plus or minus 10 percent of specified deflection values.

B. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has

characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated and the proper mountings and other devices shall be provided.

C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings or certified submittals

D. Seismic Requirements:

1. Refer to Seismic Restraint Manual: Guidelines for Mechanical Systems, published by SMACNA and approved by DSA, for minimum seismic restraints required on mechanical components design and construction details.

2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.

3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC and SMACNA guidelines.

4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.

5. For rigidly mounted liquid filled steel pipe, comply with the following:

   a. Provisions of NFPA Pamphlet 13, section for sway bracing.

   b. Provisions of NFPA Pamphlet 13, section for earthquake protection.

   c. Hanger spacing as specified in Section 23 0513 under Hanger Spacing Schedule.

   d. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems and approval by DSA.

6. For flexibly mounted liquid filled steel pipe, comply with the following:

   a. Provisions of the California Building Code for flexibly mounted equipment.

   b. Provisions of VISCMA (Vibration Isolation and Seismic Control Manufacturer’s Association) Seismic Control Device Installation, Best Practices Manuals.

c. Installer may provide a DSA or OSHPD approved system such as the SMACNA Seismic Restraint Manual with Addendum No. 1, the Mason Industries Seismic Restraint Guidelines or other proprietary pre-approved system.

7. For ductwork and other mechanical equipment restraints, comply with SMACNA Seismic Restraint Manual: Guidelines for Seismic Mechanical Systems and obtain approval by DSA.

1.3 SUBMITTALS

A. Provide in accordance with Division 01.

1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.

2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.

3. Written approval of frame design to be furnished by the equipment manufacturer.

4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etcetera.

5. Drawings indicating methods for isolation of pipes, ducts etcetera, piercing slabs, beams, etcetera.

B. Vibration Test Reports: At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given. Assistance from the vibration isolation equipment Manufacturer may be required.

1. Complete tabulation showing for each vibration isolator:

a. Actual static deflection measured at the project.

b. Specified minimum static deflection.

2. Report certifying:

a. Each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level.

b. Each piece of isolated equipment or equipment component (ducts, pipes, conduit, etcetera) is not short-circuited by any means.

c. Requirements of Part 2 are satisfied for equipment.

1.4 QUALITY ASSURANCE

A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:

1. NFPA, Pamphlet 13.

2. ASHRAE Handbook: HVAC Systems and Equipment.

3. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems.

4. California Building Code.

5. VISCMA

a. Installing Seismic Restraints for Mechanical Equipment.

b. Installing Seismic Restraints for Duct and Pipe.

B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 23 0500: Common Work Results for HVAC.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.

B. Pumps and similar motor operated equipment shall be installed on anti-vibration units.

C. Fans, except curb-mounted roof-type exhaust fans and wall mounted propeller fans, shall be installed with anti-vibration units, whether indicated on Drawings

or not. Fans built into air handling units may be furnished with independent anti-vibration mountings or whole unit may be installed on an external vibration isolation system.

D. Other equipment shall be installed on anti-vibration bases, pads, or hangers, unless specifically noted otherwise on Drawings. Package units, furnished with built in anti- vibration bases, do not require unit bases unless otherwise specified.

1. Unless specified otherwise, anti-vibration bases shall be Mason Industries, M.W. Sausse & Co., the VMC Group, or equal, of the Model Number specified or indicated on the drawings. Furnished base including sub-base, shall be manufactured by same company with fan and integral motor base. Seismic restraints may be incorporated into bases or furnished separately.

2. Inertia anti-vibration bases shall conform to requirements indicated.

3. Unless noted otherwise, furnished anti-vibration bases, including supporting units for inertia bases, shall be of the spring type.

4. Selection of bases or supporting units shall be in accordance with manufacturer's recommendations based on following installed minimum effective isolation efficiencies (where not provided with each piece of equipment):

a.	Centrifugal fans, packaged fan and coil units and cooling towers, less than 800 RPM	80 percent
b.	Centrifugal fans over 800 RPM	90 percent
c.	Centrifugal pumps	95 percent
d.	Reciprocating compressors	95 percent

E. Flexible duct connections shall be provided at inlet and outlets of each fan or HVAC unit, except curb-mounted roof exhaust fans whether indicated on the drawings or not.

F. Flexible pipe or conduit connections shall be provided at piping and conduit connections to HVAC units, pumps, compressors and other moving (reciprocating or rotating) mechanical or electrical equipment provided under this Section whether indicated on the drawings or not.

G. Flexible connections for Freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.

H. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.

I. Spool types shall be similar to American Rubber Co., Mercer Rubber Co., PROCO Products, Inc., or equal, and hose types shall be similar to DME, Inc., U.S. Flex, Pennflex, Anaconda Flexpipe, Keflex, or equal with any required modifications to meet specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.

J. Units installed in cold water lines (less than 125 degrees F) shall furnish a minimum temperature rating of 180 degrees F and those installed in hot water lines (above 125 degrees F) shall be constructed of special heat resistant materials and be furnished for a minimum temperature rating of 220 degrees F, continuous operation. Units shall be able to withstand a maximum lateral deflection of 3/8 inch. Temperature and pressure ratings shall be molded into body of each spool unit so they are easily identified. Spool types shall be for straight in flow only.

K. Spool type units shall be furnished with control units comprised of a minimum of two tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment. Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.

L. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.2 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.

B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.

C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-

dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.

D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.

E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.

F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

G. Where indicated, provide structural steel bases with height saving brackets, and minimum of three points of support. Isolators shall be furnished with a method for leveling.

H. Design isolators and seismic restraints for positive anchorage against uplift and overturning.

I. Provide and install, under this Section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.3 ISOLATOR TYPES

A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50 percent of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified.

B. Type B: Sound Isolation Pad: Provide under each spring isolator a sound isolation pad, utilizing high quality durable neoprene pad material, loaded to 40 psi. Build sound pad up to 2 layers of 1/4 inch thick neoprene material; separate layers with a 16 gage galvanized sheet metal plate. Top layer shall provide a hardness of 40 durometers and the bottom layer shall be 40 durometers. Cold bond sound pads together and to isolator baseplate.

C. Type C: Neoprene-in-Shear Isolators: Isolator shall be neoprene-in-shear type as recommended by manufacturer. Isolator shall provide a static deflection under rated load at 1/4 inch.

2.4 EQUIPMENT FRAMES

A. Provide mounting frames and brackets to carry load of equipment without causing mechanical distortion or stress to the equipment.

B. Type A Frame: Wide flange members, rigidized structural steel frame with brackets. Maximum allowable deflection at any point on load frame relative to unloaded frame shall be 0.005 inch. Members to be constructed of wide flange beams, with a depth of not less than 1/10 of length of span between isolators. Frame shall be M.W. Sausse & Co. type RMSB-W, as basis of design, or Mason Industries, Caldyn, or equal.

C. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be M.W. Sausse & Co. type RMSB-C, as basis of design, or Mason Industries, Caldyn, or equal.

D. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be M.W. Sausse & Co. type RMSG, as basis of design, or Mason Industries, Caldyn, or equal.

E. Type D Frame: Fabricated of rectangular channel steel forms for floating foundations to be filled with concrete on the Project site. Channel depth to be a minimum of 1/12th of longest dimension, but in no case less than 6 inches. Form shall include 1/2 inch reinforcing bars installed each way in a layer 1 ½ inches above bottom and drilled steel members with sleeves mounted below holes to receive equipment anchor bolts. Weight of concrete and frame shall be two times or more than the weight of the unit it supports. Frame shall be M.W. Sausse & Co. type RMSBI, as basis of design, or Mason Industries, Caldyn, or equal.

2.5 MATERIALS AND CONSTRUCTION

A. Duct Silencers: Provide factory fabricated duct silencers of tubular or rectangular type, for low or medium velocity service, with arrangements, sizes, and capacities as indicated on the Drawings.

1. Construction:

a. Fabricate silencers of galvanized steel with casing seams sealed or welded to be airtight at a pressure differential of 8 inches water

gage between inside and outside of unit, and stiffen or brace as necessary to prevent structural failure or deformation at same condition, or audible vibration during normal operation. Outer casings of rectangular silencer modules shall be made of 22 gage galvanized steel in accordance with ASHRAE Guide of recommended construction for high-pressure rectangular ductwork. Seams shall be lock formed and mastic filled. Outer casings of tubular silencers shall be made of galvanized steel in 18 to 22 gage. Internal acoustic elements of rectangular silencers shall incorporate integral die formed entry and exit to minimize pressure drop and self-noise. Interior partitions for rectangular silencers shall be fabricated of not less than 26 gage galvanized perforated steel. Interior construction of tubular silencers shall be compatible with the outside casings.

b. Filler material shall comply with the following:

1) Fire Safety Standards: NFPA 90A and NFPA 90B.

2) Temperature: ASTM C411.

3) Air velocity: ASTM C1071, UL 181.

4) Fire Hazard Classification: ASTM E84, UL 723-Class 1, NFPA 255.

5) 5Corrosion Resistance: ASTM C739, C665.

6) Fungi Resistance: ASTM G21.

7) Water Vapor Sorption: ASTM C1104, less than 1 percent by weight.

8) Formaldehyde, Phenolic Resins or other Volatile Organic Compounds: 0 percent.

c. Airtight construction shall be provided by furnishing a duct sealing compound installed on the Project site. Silencers shall not fail structurally when subjected to a differential air pressure of 8 inches w.g. inside to outside of casing.

2. Acoustic Performance: Silencer ratings shall be determined in a duct-to-reverberant room test facility, which provides for airflow in both directions through the test silencer in accordance with ASTM Standard E477. The test facility shall be accredited by the National Voluntary Laboratory Accredited Program for the ASTM E477 test standard. Data from a non-accredited laboratory is not permitted. The test set-up and procedure

shall eliminate effects due to end reflection, directivity, flanking transmission, standing waves, and test chamber sound absorption. Acoustic ratings shall include dynamic insertion loss (DIL) and self-noise (SN) power levels both for forward flow (air and noise in same direction) and reverse flow (air and noise in opposite directions). Data shall be for test silencers no smaller than the following cross-sections:

Rectangular, inches - 24 by 24, 24 by 30, or 24 by 36

Tubular, inches - 12, 24, 36, and 48

a. Noise reduction values (dynamic insertion loss) in decibels reference 10-12 watts, shall not be less than (of the model, size and length) indicated on Drawings.

b. Self-generated noise in decibels reference 10 to 12 watts, shall not be more than of the model, size and length indicated on Drawings.

3. Aerodynamic performance: Airflow measurements shall be performed in accordance with ASTM specification E477 and applicable portions of ASME, Air Movement and Control Association (AMCA), and Air Diffusion Council (ADC) airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented. Air pressure drops shall not exceed those (of the model, size and length) indicated on Drawings.

4. Certification: With submittals, provide certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance for reverse and forward flow test conditions. Test data shall be for a standard product. Rating tests shall be conducted in the same facility, shall utilize the same silencer, and shall be open to inspection if required by the Architect.

5. Rectangular silencers shall be Industrial Acoustics Company of the model number indicated on the drawing, as basis of design, or Vibro-Acoustics, Dynasonics, SEMCO Silentair, TranSonics, Inc., or equal.

B. Duct Liner: As indicated in Section 23 0700: HVAC Insulation.

C. Flexible Ducts: As indicated in Section 23 0700: HVAC Insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide isolators, flexible pipe connectors, flexible electrical conduit and flexible duct connectors at all moving mechanical system components to prevent transmission of vibration noise to any part of building whether indicated on the drawings or not.

B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.

C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.

D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.

E. Where equipment is belt driven and motor is not installed on equipment, install motor and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse & Co., type RMSF, Caldyn, or equal.

F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.

1. Coordinate Work with other trades to avoid rigid contact with building.

2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.

3. Obtain inspection from the Project Inspector for concealed Work before enclosure.

4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.

G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of shafts or bearings.

Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.

H. Air Compressors, Water Chillers, Pumps, Boilers with Integral Combustion Fans and Miscellaneous Equipment, mounted on roof or raised floors: Install each unit with its motor on a vibration isolated base utilizing type B frames, except where a type D frame is indicated on Drawings. Install steel support frame furnished by equipment manufacturer, utilizing equipment anchor bolt templates and isolator height saving brackets. Provide springs as specified for type “A” isolator; static deflection shall be a minimum of 2 inches.

I. Fans (2000 rpm or higher) Air Compressors and Miscellaneous Equipment, mounted on grade: As specified for grade mounted boilers except furnish type C isolators.

J. Boilers mounted on grade: Install each unit on concrete housekeeping pad with sound isolation pad designed for applicable equipment loading. Unit shall be fastened to housekeeping pad to prevent any movement.

K. Air Handling, Air Conditioning Units, Floor Mounted Fans, and Cabinet-Installed Fans: Install entire casing including filters, mixing box, fan section, coil sections, etc., on a continuous, integral, structural steel base, as indicated. Furnish type A, B, or C frames, reinforced as necessary to prevent distortion of frame. Furnish isolator type A; static deflection shall be a minimum of l ½ inches.

L. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators. Support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

M.

Fan RPM	**Min. Deflection**
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inch

N. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first five support locations away from vibrating equipment shall have the same deflection as the equipment isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomeric element, with lower rod capable of 30 degrees total misalignment without contact on spring housing.

O. Seismic Restraints: Floor or pad mounted equipment that do not require vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.

P. Ductwork, duct acoustical lining, manual volume dampers and flexible ducts: Do not reduce length of duct runs, duct acoustical lining, manual volume dampers and flexible ducts for economy.

Q. Installation of flexible ducts at air inlets and outlets: Do not attach flexible ducts directly to air inlets and outlets unless a straight, smooth and uniform air flow can be achieved with sufficient space to make an elbow with a radius of at least three times the diameter of the duct. If sufficient space is not available to make such an elbow, provide a rigid elbow or a lined plenum.

R. Placement of Air Devices: Do not relocate air devices without the Architect's approval.

3.2 EXAMINATION

A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect, signed by above representative, indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

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SECTION 23 05 53

HVAC IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Marking and identification required on mechanical piping systems, ducts, controls, valves, apparatus, etcetera.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 0513: Basic HVAC Materials and Methods.
3. Section 23 3000: Air Distribution.
4. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.3 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 23 0500: Common Work Results for HVAC.
2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.
3. APWA: Uniform Color Code.

   Or

4. IAPMO: Uniform Plumbing Code (UPC).

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.2 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.

E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.3 INSTRUMENTS AND CONTROLS

A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.

B. Identify alarm indicating devices and alarm reset devices by nameplates.

C. Identify damper motors and automatic valves, flow switches, pressure switches, etc., with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.4 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation

indicated on the “As-Built Drawings”. Room numbers in the nameplates shall correspond to the final room numbers.

2.5 ABOVE GRADE PIPE IDENTIFICATION

A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.

B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.

C. Size:

Outside Diameter of Pipe or Insulation	**Length of Color Field**	**Size of Letter**
3/4 to 1 1/4-inch	8-inch	½-inch
1 1/2 to 2-inch	8-inch	¾-inch
2 1/2 to 6-inch	12-inch	1 ¼-inch”
8 to 10-inch	24-inch	2 ½-inch”
over 10-inch	32-inch	3 ½-inch

D. Colors: As indicated in schedule.

E. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etc.).

2. Near each valve and branch connection in such accessible piping.

3. At each pipe passage through wall or floor.

4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.

5. At each change in direction.

F. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels, as required by the Project Inspector.

G. Schedule:

Content of Pipe	**Legend**	**Background Color**	**Lettering Color**
Refrigerant Liquid	Refrigerant Liquid	Yellow	Black
Refrigerant Suction	Refrigerant Suction	Yellow	Black

2.6 IDENTIFICATION OF AIR CONDITIONING EQUIPMENT

A. Provide identification markers to locate air conditioning equipment above T-bar ceilings. Install 3/4 inch to one inch diameter colored self-adhesive dots to T-bar ceiling grid indicating point of access. The following identification markers shall be recorded on the project record documents:

1. Fire Damper and Combination Fire/Smoke Fire Damper: Red.

2. Manual Volume Dampers, Relief Dampers, Motorized Volume Dampers: Blue.

   a. Supply air: Full dot.

   b. Return air: Half dot.

3. Fan coil unit: Green.

4. Filter Location if separate from fan coil: Yellow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.2 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. This Section specifies the requirements for test and balance of HVAC and related systems.

B. RELATED REQUIREMENTS

1. Section 23 0500: Common Work Results for HVAC.
2. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
3. Section 23 3000: Air Distribution.
4. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 DEFINITIONS AND APPLICABLE PUBLICATIONS

A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, NEBB, TABB, ASHRAE, ANSI and SMACNA.

1. TAB: Testing, Adjusting and Balancing.
2. TABB: Testing, Adjusting and Balancing Bureau.
3. AABC: Associated Air Balance Council.
4. NEBB: National Environmental Balancing Bureau.

5. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.

6. ANSI: American National Standards Institute.

7. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

8. OAR: OWNER'S Authorized Representative

3.2 QUALITY ASSURANCE

A. The General Contractor shall contract directly with the test and balance agency. Tests performed by testing agencies contracted with the system's subcontractor will not be accepted. The qualifications of the agency shall comply with Article 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust, and balance the heating, ventilating, and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

B. CONTRACTOR shall obtain services of an independent, qualified testing agency acceptable to Architect to perform testing and balancing Work as specified and as follows:

1. Agency shall be currently certified by either the Associated Air Balance Council (AABC), the National Environmental Balancing Bureau (NEBB), or the Testing, Adjusting and Balancing Bureau (TABB). NEBB or TABB certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.

2. Work shall be in accordance with the latest edition of the AABC, NEBB, or TABB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard, then the Contract Documents shall prevail.

C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting, and Balancing agenda.

D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC, Section II of the NEBB, or TABB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

E. Verification: The Test and Balance Agency shall recheck 10 percent (minimum 10) of the measurements listed in the report. The locations shall be selected by

PROJECT INSPECTOR or OAR. The recheck will be witnessed by PROJECT INSPECTOR or OAR. If 20 percent of the measurements that are retested differ from the report and are also out of the specified range, an additional 10 percent will be tested. If 20 percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by PROJECT INSPECTOR or OAR. When there are multiple air systems, a system selected by PROJECT INSPECTOR or OAR shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid, and all test and balance work shall be repeated.

3.3 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five commercial or industrial HVAC system TAB projects of similar type, size, and degree of difficulty. Agency shall provide name and telephone number of contact person for each listed project.

B. Submit, for approval, 6 copies of the Agenda as indicated in Article 3.06 to test and balance all mechanical and relevant plumbing systems.

C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to ARCHITECT, PROJECT INSPECTOR and OAR indicating deficiencies in Work precluding proper testing and balancing of the Work.

D. Final TAB Report: Submit the final TAB report for review by ARCHITECT, PROJECT INSPECTOR, and OAR outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

E. Submit an AABC “National Project Performance Guaranty” or “NEBB Quality Assurance Certification”, assuring the Project systems were tested, adjusted, and balanced in accordance with the Specifications and AABC, NEBB, or TABB National Standards.

F. CAD drawings: Submit single line, multi-color CAD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed, and CONTRACTOR installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls, and devices shall be marked on the drawings to show final settings. CAD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed Work and the Contract Documents affecting the performance and longevity of the system.

3.4 GENERAL SCOPE OF WORK

A. The general scope of Work shall include but not be limited to the following:

1. Measure airflow rates of HVAC systems and make adjustments to achieve design airflow rates, tabulate results, and submit reports.

2. Measure water-flow rates of HVAC systems and make adjustments to achieve design water flow rates, tabulate results, and submit reports.

3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps, and other related HVAC system components, tabulate results, and submit reports.

4. Measure sound levels in each conditioned space, tabulate results, and submit reports.

5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results, and submit reports.

6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components

3.5 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Air Conditioning Units.

2. Supply, Return, Relief and Exhaust Fans.

3. All Supply and Return Ductwork.

4. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.

5. Exhaust Duct Systems.

6. Kitchen Hoods.

3.6 TESTING, ADJUSTING, AND BALANCING AGENDA

A. Provide proposed materials, methods, procedures, forms, diagrams, and reports for test and balance Work.

B. Agenda to be completed by the test and balance agency and submitted to ARCHITECT, PROJECT INSPECTOR, and OAR for review and approval.

C. Agenda shall include one complete set of AABC, NEBB, or TABB publications listed in Sub-paragraph 3.02.B.2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic, and uniform set of procedures.

D. Agenda shall also include the following detailed narrative procedures, system diagrams, and forms for test results:

1. Specific standard procedures required and proposed for each system of the Work.

2. Specified test forms for recording each procedure and for recording sound and vibration measurements.

3. Systems diagrams for each air, water, and steam system. Diagrams may be single line.

E. In addition to information recorded for standard AABC, NEBB, or TABB procedures, the following information is required:

1. Fan data.

2. System number, location, manufacturer, model, and serial number.

3. Fan wheel type and size.

4. Motor horse power, type, and rpm.

5. Sheave size, type, number of grooves, and open turns on Variable Pitch Sheave.

6. Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated, and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity.

7. Fan design airflow and service (supply, return, outdoor air or exhaust).

8. Fan static pressure, suction/discharge, static profile, and static control point.

F. The following traverse data is required:

1. Traverse location, size of duct (inside dimensions), and area of duct in square feet.

2. Column for each hole traversed/lines for each reading.

3. Barometric pressure.

4. Temperature/Static pressure in the duct.

5. Actual CFM corrected to SCFM.

6. Notes.

G. The following air distribution data is required:

1. Room identification.

2. Outlet or intake balance sequence number.

3. Size of outlet or inlet.

4. AK Factor.

5. Design and Actual FPM and CFM.

6. Notes.

H. The following DX coil data is required:

1. Air flow through the coil in CFM.

2. Dry and wet bulb temperatures entering/leaving coil.

3. Enthalpy or total heat difference across coil in BTU/ pound.

4. Capacity in BTU/hour at time of test.

5. Air pressure drop across coil.

6. Notes.

I. The following boiler and domestic water heater data is required:

1. Performance test results for rated capacity.

2. Boiler identification number.

3. Nameplate data; manufacturer, model, and serial number.

4. Water temperature entering/leaving the boiler.

5. Outside conditions: temperature, humidity, general cloud cover.

6. Barometric pressure.

J. The following air-cooled split system heat pump data is required:

1. Performance test results for rated heating and cooling capacities.

2. Unit identification number.

3. Nameplate data, manufacturer, model, and serial number.

4. Compressor nameplate and actual amps, volts, phase, and hertz.

5. RPM of motors, where applicable.

6. Refrigerant type.

7. Suction/Discharge pressure for both heating and cooling modes when gage installed.

8. Number of stages.

9. Low-pressure/High-pressure control setting.

10. Condenser fan sequence stages.

11. Crankcase heater watts (nameplate).

12. Hot gas bypass installed - yes/no.

13. SCFM Air Flow Measurement vs. Design CFM.

K. The following sound test data is required:

1. Area or location.

2. Sound level in dB(A) as specified in Article 3.19.

3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the OAR/PROJECT INSPECTOR.

4. Plot of corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.

L. The following vibration test data is required:

1. Equipment identification number.

2. Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators.

3. Measurements in mils deflection and velocity in inches per second.

4. Each measurement taken in horizontal, vertical, and axial planes as accessible.

M. The following fan coil and unit ventilator data is required:

1. Equipment identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Tested supply CFM or manufacturer rated CFM if not ducted.

4. Tested outside air in CFM.

5. Motor data and actual amps and volts.

6. Cooling/Heating test data.

7. Static pressure.

8. Notes.

N. The following kitchen hood data is required:

1. Hood identification number.

2. Nameplate data; manufacturer, model, and serial number.

3. Pitot-tube traverse total air flow.

4. Exhaust and supply (when part of hood) CFM.

5. Exhaust and supply (when part of hood) test velocities shown on hood face diagram.

6. Face velocities.

7. Hood opening dimensions.

8. Notes (turbulence and flow patterns at the face and inside the hood).

O. The following pump data, including but not limited to, chilled water, heating hot water, cooling tower water, boiler feed, domestic hot water booster, domestic hot water circulation, sewage ejectors, sump pumps and domestic hot water booster is required:

1. Pump number.

2. Nameplate data; manufacturer, model, and serial number.

3. Motor data including nameplate data, actual amps, volts, RPM, horsepower, starter heater size, and capacity.

4. Pump discharge and suction pressure along with total dynamic head in the following modes.

5. Shut-off head FT, Wide open Head FT, and Final operating Head FT.

6. Final GPM Test plotted on a pump curve.

7. Notes.

3.7 PROCEDURES

A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. CONTRACTOR shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested, and balanced.

B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air handling units,

and air conditioning units into a 100 percent outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of fourteen (14) days.

C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

3.8 FIELD EXAMINATION

A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:

1. Ensure that all water heating and water-cooling systems have been flushed, cleaned, and filled and high points vented.
2. Boilers (steam and hot water) are filled.
3. Refrigerant systems are fully charged with specified refrigerant.
4. Over-voltage and current protection have been provided for motors.
5. Equipment has been labeled as required.
6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required.
7. Operations and maintenance manuals have been supplied.
8. Controls manufacturer and boiler-burner representatives shall be available for consultation and supervision of adjustments during tests.
9. Verify that heating and cooling coil fins are cleaned, combed and air filters clean, and installed.
10. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed and duct end caps are in place, and fire and volume dampers are in place and open.
11. Automatic control systems are completed and operating.
12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.

B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the

various phases of the Work. The evaluation shall address, at a minimum, the following concerns:

1. OWNER operations.

2. Building safety and security policies. Prior to any fire safety or security systems shutdown at any time during the Work, CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.

3. Protecting furniture, computers, photocopiers, and other office equipment.

4. Protecting classroom fixtures and equipment.

5. Concerns specific and unique to building related issues.

6. Downtime required for each Air Handling Unit including projected time to return each portion of the building back to its normal occupancy temperature and humidity.

7. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

3.9 TEST AND BALANCE

A. For each heating, ventilating, or air conditioning system the following shall be performed, recorded, and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:

1. Air Systems:

a. General

1) Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the fully open position. Agency shall perform the following TAB procedures in accordance with AABC or NEBB National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.

b. Zone, Branch, and Main Ducts:

1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.

c. Supply Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys when required.

2) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.

4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

5) Static Pressure: Test and record system static profile of each supply fan.

6) Current and Voltage: Test and record motor voltage and amperage, and compare data with nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

d. Return, Relief, and Exhaust Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys where required.

2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.

3) Static Pressure: Test and record system static profile of each fan.

e. VAV Systems:

1) Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.

2) Identification: Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.

f. Diffusers, Registers and Grilles:

1) Tolerances: Test and balance each diffuser, grille, and register to within 5 percent of design requirements.

2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This Inflation shall be recorded on air outlet data sheets.

g. Coils: Air Temperature: Once airflow is set to acceptable limits; agency shall take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

h. Duct Leakage Testing:

1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.

2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust, and relief ductwork) shall be tested at 1.5 times design static pressure. All ducts shall demonstrate 5 percent leakage maximum (per CBC).

i. Air Handling Units:

1) Prepare pressure profile and show design and actual CFM (outside air, return air, and supply air).

2) Measure and record each mode (minimum OA and 100 percent OA) where economizer cycle is specified.

3) Record pressure drops of all components (coils, filters, sound attenuators, louvers, dampers, and fans) and compare with design values.

4) Pressure profile and component pressure drops are performance indicators and are not to be used for flow measurements.

j. System Pressure Profiles:

1) Prepare pressure profiles from fan (supply, return, and exhaust) or air handling unit to extremities of system.

2) As a minimum, show pressure at each floor, main branch, and airflow measuring device.

3) Make pitot-tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.

4) Record residual pressures at inlets of volume-controlled terminals at ends of system.

5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

k. Fan speed adjustments and balancing for optimum acoustical performance:

1) As the very first step, the speed of all fans (supply, return, and exhaust inside packaged equipment or air handling units) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers, and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the 100 percent outdoor air position in systems with 100 percent outdoor air economizers.

2) The above adjustment shall be done with wet cooling coils, where cooling coils are provided.

3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.

4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60 percent open or when the dampers start to generate audible noise.

5) CONTRACTOR shall provide the labor and materials for all dampers, pulleys, and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.

2. Water Systems: CONTRACTOR shall confirm all equipment, piping, and coils have been filled and purged, strainers are clean, and all balancing valves (except bypass valves) are set full open. Agency shall perform the following TAB procedures in accordance with the AABC, TABB, or NEBB National Standards:

B. Pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to achieve maximum or design GPM.

2. Measure and record suction and discharge pressures.

3. Check pumps for proper operation. Pumps shall be free of vibration and cavitation.

4. Current and Voltage: Agency shall test and record motor voltage and amperage and compare data with the nameplate limits. Ensure pump motor is not in or above the service factor as published by the motor manufacturer.

5. Adjust pump flow by adjusting and setting balancing valves to obtain amperage reading on a clamp-on ammeter that corresponds to amperage indicated on pump's curves for required flow.

6. Verify that the motor is not drawing more current than indicated on motor plate rating. When actual flows of primary pumps are found by test to vary more than 5 percent from specified amount, system shall be re-balanced to regulate flow within this tolerance. When a flow indicating device(s) is in circuit, it shall be used to verify pump flows.

7. When testing is completed, a pump capacity chart with pump number and location indicated shall be marked indicating operating point of pump on the curve. Chart shall then be included in the report.

C. Boilers: (Start-up and initial commissioning by manufacturer only.) Test and balance boilers only after test and balance of pumps have been completed. Boilers shall not be initially operated or tests performed with students or faculty on the Project site. Boilers shall be tested for the following:

1. Heating Hot Water Boilers and Domestic Hot Water Boilers:

a. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure motor is not in or above the service factor.

b. Test and balance water flow through water boilers.

c. Test and record temperature and pressure profiles of water and/or steam boilers.

d. Upon completion of tests, controls and devices shall be returned to their normal operating condition and boiler shall remain in service.

2. Steam Boilers: Start-up and initial commissioning by manufacturer only.

3.10 VERIFICATION OF HVAC CONTROLS

A. Agency shall verify in conjunction with CONTRACTOR all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stats, and other safety devices.

B. CONTRACTOR shall verify all control components are calibrated and set for design operating conditions and intent.

3.11 TEMPERATURE TESTING

A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two-hour intervals in each separately

controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

3.12 BUILDING/ZONE PRESSURIZATION

A. Agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differentials. Positive/Negative area(s) supply air shall be set to design flow and exhaust air rates adjusted to obtain the required pressure differential(s).

3.13 FIRE AND SMOKE DAMPER TESTING

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of work.

3.14 Life Safety Controls TESTING

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of Work.

3.15 FINAL TABULATION

A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus five percent of design requirements.

B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for three (3) days. Boilers, forced air furnaces, and chillers shall be started up far enough in advance to meet design conditions during period of testing.

3.16 VIBRATION TESTING

A. Furnish instruments and perform vibration measurements if specified in Division 23. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans, and motors.

B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to ARCHITECT.

3.17 SOUND TESTING

A. A. Perform and record sound measurements as specified in this Section and in Section 23 0548: HVAC Sound, Vibration and Seismic Control. Take additional readings if required by ARCHITECT.

B. Measuring equipment and methods shall comply with the current requirements of the AABC, NEBB, TABB and ANSI S12.60. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.

C. Sound reference levels, formulae, and coefficients shall be according to ASHRAE Handbook: HVAC Applications, Chapter on Sound and Vibration Control.

D. Where sound pressure levels are specified as noise criteria or room criteria in Section 23 0548: HVAC Sound, Vibration and Seismic Control determine compliance with the Contract Documents as follows:

1. Reduce background noise as much as possible by shutting off unrelated audible equipment.

2. Measure octave band sound pressure levels with specified equipment "off".

3. Measure octave band sound pressure levels with specified equipment "on".

4. Use difference in corresponding readings to determine sound pressure due to equipment. Sound pressure level, due to equipment equals sound pressure level with equipment "on" minus factor.

5. DIFF.: 0, 1, 2, 3, 4, 5, 9, 10 or More

6. FACTOR: 10, 7, 4, 3, 2, 1, 0

7. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.

E. Where sound levels are required in dbA, measure sound levels using the A-frequency-weighting of meter. Single value readings will be used instead of octave band analysis.

F. Measure sound levels at each octave band as NC or RC (room criteria) if indicated in the Drawings or other Spec Sections. Where measured sound

levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated. Sound tests after remedial action shall be in octave band in NC or RC for the room and also at each diffuser, grille, or register in occupied areas. Sound levels shall be measured approximately five feet above floor on a line approximately 45 degrees to center of opening, on the A- and C-frequency-weighting of the measuring instrument.

G. Measure and record sound levels in decibels for each room per current ANSI S12.60.

H. Report shall include ambient sound levels, taken without air-handling equipment operating, of rooms in which above openings are located. A report shall also be made of any noise caused by mechanical vibration.

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SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Condensate drain piping from air conditioning equipment.
2. Refrigerant piping.
3. Supply and return air ducts for heating and cooling systems air ducts.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 0500: Common Work Results for HVAC.
3. Section 23 0553: Mechanical Identification.
4. Section 23 3000: Air Distribution.
5. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
2. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
3. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
4. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

5. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

7. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

8. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

9. ASTM C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.

10. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

11. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

12. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

13. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Underwriters Laboratories Inc.:

1. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

2. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems .

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1. Complete material list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.

3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.

4. Display sample cutaway sections.

5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.4 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC and Section 23 0513: Basic HVAC Materials and Methods.

B. Test Ratings:

1. Comply with provisions stated under Section 23 0500 and 23 0513 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.

2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

C. Regulatory Requirements: Insulation furnished and installed under this Section shall conform to the requirements of the California Building Code Parts 4, Mechanical Code, Part 5, Plumbing Code and Part 6, Energy Code.

D. All chemically based products such as sealers, primers, fillers, adhesives, etc. shall meet the California air quality regulations.

1.5 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 23 0500: Common Work Results for HVAC and 23 0513: Basic HVAC Materials and Methods.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. Piping insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Piping insulating material shall be furnished with thickness indicated in Table 1, unless otherwise noted on the drawings, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

    a. Nylon anchors for installing insulation to ducts or equipment.

    b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)

Piping System Type	**Temp. Range (degrees F)**	**Run-outs up to 2** (2)	**1 and less**	**1.25 to 2**	**2.5 to 4**	**5 to 6**	**8 and larger**
Refrigerant Suction	105 – 140	1.0	1.0	1.0	1.0	1.0	1.0
Refrigerant Liquid	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Condensate Drain	1/2 inch Minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From Air Conditioning Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES: (1) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(2) Run-outs to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Furnish 6 ounce in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½ inch to 8 inches shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024 inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.2 COOLING PIPING SYSTEM INSULATION

A. General: Insulate refrigerant piping.

B. Materials:

1. Classes of Insulation:

a. Class A: Expanded polystyrene pipe insulation, self-extinguishing type, either molded or extruded; Dow Chemical Co. STYROFOAM, ITW Insulation Systems XPS PIB, Foam-Control EPS, or equal.

b. Class B: Glass fiber molded pipe insulation ASTM C547. Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, CertainTeed Snap-On, Owens Corning FIBERGLAS SSL II-ASJ, or equal.

c. Class C: Expanded (foamed) urethane (polyurethane) or polyisocyanurate pipe insulation of self-extinguishing type molded or fabricated, Dyplast Products, LLC ISO-C1/2.0, ITW Trymer, Specialty Products & Insulation Co. Polyisocyanurate Pipe Insulation, Armacell Armalok, or equal.

d. Class D: Foamed plastic pipe insulation, self-extinguishing type, ASTM C534 Type 1 - tubular. Pipe insulation shall be one-piece preformed, flexible tubing type and provide a maximum K factor of 0.28 at 75 degrees F mean temperature. Pipe insulation shall be Armacell Armaflex, Aeroflex Aerocel, Rubatex INSUL-TUBE 180, or equal.

2. Locations and Class of Insulation Required: For thickness required, refer to Table 1 of this Section.

TABLE 3 – SERVICE, LOCATION AND CLASS OF INSULATION REQUIRED

SERVICE	LOCATION	CLASS OF INSULATION
Condensate drains from air conditioning equipment	Indoors at all locations including above ceilings and between stud walls	D
Refrigerant suction and liquid piping	All locations except underground	D
All other piping, except underground	All locations except underground	A, B, C

3. Adhesives:

a. Polystyrene adhesives: Synthetic rubber and resin adhesives specifically designed to adhere extruded and expanded rigid polystyrene and urethane insulation to themselves and to other porous and non-porous substrates.

b. Vapor barrier laps and penetrations: Furnish protective coating and lagging adhesive on butt joints of foil-faced vapor barriers, and where pins and staples puncture facings.

2.3 DUCTWORK AND PLENUM INSULATION

A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 4, unless noted otherwise on the drawings. Insulation may be omitted under the following conditions:

1. Exposed return air ductwork in conditioned space.

2. Return air ductwork between wall studs inside an interior wall.

TABLE 4 - INSULATION OF DUCTS AND PLENUM

INSULATION TYPES

Duct Location	Heating and Cooling
Exposed interior supply ductwork	DW-1
On roof, and exterior of building	DW-2
In walls, within floor/ ceiling spaces	F-1
Hot and cold plenums	F-2 or DW-1
Attics, Garages, and Crawl Spaces, within unconditioned space or in basement	F-3

B. Insulation Types:

1. DW-1: 1 inch thick insulation sandwiched inside double-wall type ducts and fittings. Duct joints shall be waterproofed.

2. DW-2: 2 inch thick insulation sandwiched inside double-wall type ducts and fittings. Duct joints shall be waterproofed.

3. F-1: 1 ½ inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

4. F-2: 2 inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

5. F-3: 3 inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

C. Notes:

1. Minimum insulation provided shall be as required by the current California Mechanical Code Title 24 for the most restrictive condition.

2. Refer to the materials indicated in this section for external insulation.

3. Insulation lining the duct interior is not permitted.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit State Fire Marshal pre-approved materials only.

2. Adhesives: See Paragraph 2.01.E for applicable products.

3. External Insulation: Provide glass fiber blankets that are factory-laminated with Foil Reinforced Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens-Corning SOFTR Duct Wrap, Knauf Insulation Friendly Feel Duct Wrap, or equal. Provide a minimum installed R value as required by the CEC Building Energy Efficiency Standards; but not less than scheduled below:

TABLE 5

INSULATION OF DUCTS AND PLENUM INSTALLED

THERMAL RESISTANCE R VALUES

Type	Labeled Thickness (in inches)	Installed R Value ($hr.ft^2.°F/Btu$)
F-1	1 ½	4.2
F-2	2	5.6
F-3	3	8.3
DW-1	1	4.2
DW-2	2	5.6

PART 3 - EXECUTION

3.1 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as

rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where fire-stop or fire-safing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On vacuum return lines less than 50 feet long.

2. On unions, flanged connections or valve handles.

3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.

4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.2 INSTALLATION OF COOLING PIPING SYSTEM INSULATION

A. General: Chilled water supply and return piping, refrigerant piping and condensate drain lines, after having been tested, shall be cleaned and insulated.

B. Application: Insulation on chilled water lines, refrigerant suction lines and liquid lines, if indicated, and air conditioner interior drain lines shall be jacketed with fire-resistant vapor barrier of laminated aluminum foil consisting of 2 plies with glass-yarn reinforcing. Jacket joints shall be lapped and sealed with an approved adhesive. Insulation shall be secured with aluminum bands not less

than 0.005 inch thick by 3/4 inches wide, spaced not over 12 inches on centers, or as recommended by manufacturer.

1. Longitudinal Seams: Butt hinged sections of covering tightly together and seal down jacket flap with adhesive, or with factory-applied, self-sealing lap with pressure-sensitive sealer protected with release paper.

2. End Joints: Wrap joint with a 3-inch wide (minimum) self-sealing tape.

3. Fittings and Valves: Fittings and valves shall be covered with same material of same thickness as pipe insulation, sealed with an approved, vapor-sealing tape or compound and covered with Johns Manville Zeston polyvinyl-chloride cover, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal.

4. Pipe hangers shall be insulated or attached to pipe by an insulating insert, butted between adjoining insulation sections.

C. Additional Jackets:

1. Exposed Indoor Insulation: Cover with 26 gage galvanized sheet metal jacket to 8 feet above floors, except in mechanical equipment rooms and accessible pipe tunnels.

2. Exposed Outdoor Insulation: In addition to canvas or fiberglass cloth cover, provide 0.016 inch thick aluminum jacket with one inch wide aluminum bands and seals. Install appropriate jackets on valves and fittings.

3.3 INSTALLATION OF DUCTWORK AND PLENUM INSULATION

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams, inspected pressure tested, and accepted by LAUSD OAR/ Inspector.

2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2 inches. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12 inches on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.

3. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts when pre-conditioned, shall be furnished with a factory-applied, fire-resistant vapor barrier.

4. Exposed Ducts or Plenum:

   a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.

   b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.

3.4 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.5 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

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SECTION 23 08 00

HVAC SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for Commissioning (Cx) of HVAC systems and equipment including installation, start-up, testing, documentation, and training according to the Construction Documents.

2. Standard procedures for the execution of commissioning work shall be in conformance with Division 01, Section 01 9113: General Commissioning Requirements. Coordinate work with the Commissioning Agent (CxA).

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 05 93: Testing, Adjusting, and Balancing for HVAC.
3. Section 23 0500: Common Work Results for HVAC.
4. Section 23 3000: Air Distribution.
5. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.
6. Section 26 0500: Common Work Results for Electrical.
7. Section 26 0513: Basic Electrical Materials and Methods.
8. Section 26 0519: Low Voltage Wires (600 Volt AC).
9. Section 26 0526: Grounding and Bonding.
10. Section 28 3149: Carbon Monoxide Detection and Alarm Systems.
11. Section 26 0800: Electrical Systems Commissioning.
12. Project Commissioning Plan (CxP).

1.2 REFERENCES

A. Applicable codes, standards, and references: inspections and tests shall be in accordance with the following applicable codes and standards:

1. InterNational Electrical Testing Association – NETA.
2. National Electrical Manufacturers Association – NEMA.
3. American Society for Testing and Materials – ASTM.
4. Institute of Electrical and Electronics Engineers – IEEE.
5. American National Standards Institute – ANSI.
6. National Electrical Safety Code – NESC.
7. California Building Code – CBC.
8. California Electrical Code – CEC.
9. California Mechanical Code – CMC.
10. Insulated Cables Engineers Association – ICEA.
11. Occupational Safety and Health Administration – OSHA.
12. National Institute of Standards and Technology – NIST.
13. National Fire Protection Association – NFPA.
14. American Society of Heating and Air-Conditioning Engineers – ASHRAE
15. (The HVAC Commissioning Process, ASHRAE Guideline).
16. Associated Air Balance Council – AABC (National Standards for Total System Balance).

1.3 SUBMITTALS

A. Submittal's package shall include the following:

1. Commissioning required submittals in accordance with Division 01 Specification Sections.
2. Copy of the Architect's reviewed and accepted submittals to the CxA via the OAR.
3. List of team members who will represent the Contractor in the Pre-functional Equipment Checks (PEC) and Functional Performance Tests (FPT), at least six weeks prior to the start of Pre-functional Equipment Checks.

4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, a copy of full details of Owner-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of Owner to keep Warranty in force clearly defined.

5. Installation and checklist documentation shipped with equipment and field checklist forms to be used by factory or field technicians.

6. Detailed manufacturer's recommended procedures and schedules for PECs, supplemented by Contractor's specific procedures, and FPTs, at least four weeks prior to the start of PEC.

1.4 MEETINGS, SEQUENCING AND SCHEDULING

A. Meetings: Attend the Cx meetings as required under Section 01 9113 and Cx Plan.

B. Sequencing and Scheduling: The work described in this Section shall begin only after work required in related Divisions 23 and 26 Sections has been successfully completed and tests, inspection reports, and Operation and Maintenance manuals required have been submitted and accepted. The start-up and PEC shall be completed and submitted to the Owner at least two weeks prior to beginning FPT.

1. Coordinate HVAC work with the work of other trades prior to scheduling of any Cx procedures.

2. Coordinate the completion of HVAC testing, inspection, and calibration prior to start of Cx activities.

1.5 QUALITY CONTROL

A. Comply with Division 01 quality control specifications.

B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this Section.

C. Comply with Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

1.6 EQUIPMENT AND SYSTEMS TO BE COMMISIONED

A. Split Systems.

B. Fan Coil Units.

C. Exhaust Fans.

D. Pumps.

E. Water Heaters, Gas and Electric.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Equipment to be utilized in the commissioning process shall meet the following requirements:

1. Provide test equipment as necessary for the testing of the equipment and systems to be commissioned.

2. Provide testing equipment and accessories that are free of defects and certified for use.

3. Provide testing equipment with current calibration labels as per NIST Standards.

4. Equipment shall be calibrated on the manufacturer's recommended intervals with calibration tags affixed to the instrument. In the absence of calibration tags, calibration documentation shall be submitted to the CxA at least thirty days prior to use; this documentation shall include description and serial number of instrument and calibration data and date.

5. Testing equipment shall be maintained in good operating condition for the duration of the project.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS REQUIREMENTS

A. Work to be performed prior to commissioning:

1. Complete phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.

2. If modifications or corrections to the installed system(s) are required to bring the system(s) to acceptance levels due to Contractor's incorrect installation or defective materials, such modifications shall be made at no additional cost to the Owner.

3. Normal start-up services required to bring each system into full operational state:

   a. Testing, motor rotation check, control sequences of operation, full and part load performance.

   b. Commissioning shall not start until each system is complete and start-up has been performed.

B. Pre-Commissioning responsibilities:

1. Inspection, calibration and testing of the equipment required to commission the following systems:

   a. HVAC System(s).

C. Commissioning Process Requirements:

1. Refer to Section 01 9113: General Commissioning Requirements and related Sections for information on meetings, start-up plans, Pre-Functional and FPT, operations and maintenance data, training requirements, and other Cx activities.

3.2 PREPARATION

A. Provide certified HVAC technicians as required, with tools and equipment necessary to perform Cx activities specified.

B. Provide certified testing agency personnel and equipment factory representatives as require in the Cx plan and other related Sections.

C. Verify that work required in this Section and in Section 01 9113 is complete prior to starting of FPT.

D. Verify that complete operational manuals have been reviewed and accepted by the CxA as specified before starting FPT.

3.3 TESTING

A. Testing procedures shall include the following minimum information:

1. Test number.

2. Equipment used for the test, with manufacturer and model number and date of last calibration.

3. Date and time of the test.

4. Indication of whether the record is for a first test or retest following correction of a problem or issue.

5. Identification of the system, subsystem, assembly, or equipment.

6. Conditions under which the test was conducted, including (as applicable); ambient conditions, set points, override conditions, status, and operating conditions that impact the results of the test.

7. Systems and assemblies test results and performance and compliance with contract requirements.

8. Issue number, if any, generated as the result of the test.

9. Name(s) and signature(s) of witnesses and the person(s) performing the test.

B. Contractor shall participate and perform Cx related testing requirements as specified.

C. General Requirements for Mechanical, Controls, and Testing and Balance:

1. Construction and Acceptance Phases:

a. Provide assistance to CxA in preparing FPT procedures specified. Sample test forms are including in the project Cx Plan.

b. Develop full startup and initial checkout plan using manufacturer's start-up procedures and Cx checklists for commissioned equipment. Submit to CxA for review and approval prior to startup.

c. During startup and initial checkout process, execute mechanical-related portions of PEC for the equipment and systems to be commissioned.

d. Perform and clearly document completed startup and system operational checkout procedure. Providing four copies of the results to the Owner.

e. Resolve any open punch list items before FPT. Air testing and balance shall be completed with discrepancies and problems remedied before FPT of respective air -related systems.

f. Provide skilled technicians to execute starting of equipment and to execute PFT. Ensure that technicians are available and present during agreed upon schedules and for sufficient duration to complete necessary tests, adjustments, and solutions to identified problems.

g. Maintain a log of events and issues of tests and related Cx activities. Submit handwritten reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests, and lists of completed tests as specified.

h. Correct open issues and re-test as needed to prove compliance with system operational standards.

i. Prepare Operation and Maintenance Manuals and provide training for the Owner maintenance personnel and end-users per Section 01 7900.

j. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of Warranty and notify the Owner.

k. Execute simulated seasonal FPT, witnessed by the Owner and the CxA, as specified. Document results and perform corrections as needed for system acceptance and make necessary adjustments to Maintenance and Operations Manuals and Record Drawings.

3.4 SENSOR CALIBRATION

A. Field-installed temperature, relative humidity, CO2, pressure sensors, pressure gages, and actuators (dampers and valves) shall be calibrated using the methods described below. Calibration procedures shall be documented during execution of the Start-up and the PEC. Alternate methods may be used, if approved by the CxA.

B. Test instruments shall have had a NIST certified calibration within the last 12 months. Sensors installed in the unit at the factory with provided calibration certification need not be field calibrated.

C. Sensors:

1. Verify that sensor locations are appropriate and away from causes of erratic operation.

2. Verify that sensors with shielded cable are grounded only at one end.

3. For sensor pairs that determine a temperature difference, make sure they are reading within 0.2 degrees F of each other.

4. For sensor pairs that determine a pressure difference, make sure they are reading within 2 percent of each other.

5. Calibration: Put the equipment in operation. Make a reading with a calibrated test instrument within six inches of the site sensor. Verify that the sensor reading (via the permanent thermostat or gage) is within the tolerance listed in the table below of the instrument-measured value. If not, calibrate or replace sensor.

6. Tolerances:

Sensor	Required Tolerance (+/-)
AHU wet bulb or dew point	2.0 degrees F
Outside air, space air, duct air temps	0.4 degrees F
Watt-hour, voltage, and amperage	1 percent of design
Pressures, air, water and gas	3 percent of sensor range (inc. design value)
Flow rates, air	10 percent of sensor range (inc. design value)
Flow rates, natural gas	5 percent of sensor range (inc. design value)
Relative humidity	4 percent
CO_2 monitor	100 ppm

Sound level	5 db - Type 1 meter (Per Calibrator Mfg.)
Domestic Hot Water Temperature	1.5 degrees F
Domestic Hot Water Pressures Water and Gas	3 percent of sensor range (inc. design value)
Flow Rates, Domestic Water	4 percent of sensor range (inc. design value)
Flow Rates	5 percent of sensor range (inc. design value)

3.5 ADJUSTING

A. Perform work required to rectify installations not meeting contract requirements at no additional cost to the Owner.

B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.

C. If systems' Cx deadline, as defined in the Project Schedule, goes beyond the scheduled completion without resolution of the problem(s), the Owner reserves the right to obtain supplementary services or equipment to resolve the problem.

3.6 TRAINING

A. Provide training plan for systems to be commissioned as required in applicable Division 23 specification sections and Section 01 7900.

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SECTION 23 09 00

HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Temperature controls for air conditioning, heating, and ventilating systems as indicated. Work includes, but is not be limited to, the following:

1. Automatic control valves and automatically operated dampers.
2. Wiring outlet boxes and conduits for control systems, including wiring to connect magnetic starters to control systems.
3. Testing and adjusting temperature control system.
4. Furnishing record drawings and operational data of systems as installed and finally adjusted.
5. Formal instruction of Owner personnel in operation of equipment.

B. Following items are specified in other Sections:

1. Magnetic starters, contacts, power relays and variable resistors or controllers for motors, and other electrical devices.
2. Load carrying wiring for above listed devices and wiring for starting switches not interconnected with temperature control system. (Division 26: Electrical).
3. Electrical power to control panels and other equipment. (Division 26: Electrical).
4. Installing automatic valves in pipelines.
5. Installing automatic dampers.
6. Automatic controls and valves not connected with comfort heating, ventilating, and air conditioning systems.
7. Packaged self-contained equipment specified complete with temperature controls.

8. DDC control equipment Environmental Control and Energy Management Systems.

C. Related Requirements:

1. Division 1: General Requirements.

2. Division 26: Electrical.

3. Section 23 0500: Common Work Results for HVAC.

4. Section 23 0800: HVAC Systems Commissioning.

5. Section 23 3000: Air Distribution.

6. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.2 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1. Complete list of items proposed to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Manufacturer's printed installation procedures.

B. Shop Drawings: Provide Shop Drawings, in the same size as the Drawings, prepared, signed and sealed by a mechanical engineer licensed in the State of California. Shop Drawings shall indicate temperature control diagrams, complete with equipment appurtenances required for system. Include sequence of operation description for each system. Submit in accordance with of Division 01.

C. Sequence of Operation: Provide complete, detailed, step-by-step sequence of operation for each item of equipment.

D. Operating Instructions: Comply with provisions of Section 23 0500: Common Work Results for HVAC. Explain and demonstrate operation of system to Owner representatives as required.

E. Guarantee: Refer to Section 23 0500: Common Work Results for HVAC.

1.3 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.

1.4 PRODUCT HANDLING

A. Production, Replacement, Delivery and Storage: Refer to Section 23 0500: Common Work Results for HVAC and Section 23 0513: Basic HVAC Materials and Methods.

PART 2 - PRODUCTS

2.1 TEMPERATURE CONTROLS

A. Provide temperature controls of pneumatic, electric, electronic microprocessor - DDC type, or a combination thereof, as indicated on Drawings, to provide required sequences or operational control.

2.2 MANUFACTURERS

A. Equipment in system shall be of same manufacturer or their standard furnished items. Testing, initial start-up, and adjusting of control system shall be under continuous observation of the mechanical engineer responsible for Shop Drawing preparation.

B. Pneumatic, electric, electronic, or direct digital microprocessor based control equipment shall be one of following manufacturers, unless otherwise noted:

1. Honeywell, Inc.
2. Johnson Controls, Inc.
3. Invensys.
4. Equal.

2.3 ELECTRIC EQUIPMENT AND ACCESSORIES

A. Electric control equipment and accessories include, but are not limited to, the following:

1. Electric control devices as indicated on Drawings and described herein, including thermostats, temperature controllers, valve and damper operators, switches, relays, and control panels for instruments as required to provide a complete and operable system.

2. Wiring and conduit, unless otherwise noted, or control systems including wiring required, to connect magnetic starters, specified in other sections, to control systems.

B. Room Thermostats:

1. Thermostats for unitary air conditioning units shall be as specified in Section 23 8000: Heating, Ventilating and Air Conditioning Equipment. Thermostats located on outside walls shall be installed on insulated backplates or as specified by unit manufacturer.

2. Provide the following room thermostats for each specific application as follows, where manufacturer's thermostats are not specified in Section 23 8000:

a. Honeywell, Johnson Controls, Invensys, or equal, for heating only; Honeywell, Johnson Controls, Invensys, or equal, for cooling only.

b. Honeywell, Johnson Controls, Invensys, or equal, microelectronic commercial thermostat with sub-base for electronic control of 18 to 30 VAC single zone HVAC equipment. Thermostat is either stand alone, or arranged in a temperature averaging network consisting of 2, 3, 4, 5, or 9 sensors for corresponding rooms or zones.

c. Honeywell, Johnson Controls, Invensys, or equal, proportional thermostat, low-voltage, 3-wire controller for valve, damper motors and balancing relays. Unit manufacturer may specify or recommend optional thermostat.

d. Provide tamper-proof locking thermostat guards for items specified above. Covers shall be opaque beige plastic in resident occupied areas, clear plastic cover in administrative areas. Provide Honeywell, Johnson Controls, Invensys, or equal, universal thermostat guards or as recommended by thermostat manufacturer.

C. Duct-Mounted Thermostats: Duct-mounted thermostats shall be modulating or 2-position as required to accomplish sequence of operation.

D. Valve and Damper Motors: Damper motors shall be furnished with oil-immersed gear trains and ample capacity to handle required loads under normal operating conditions. Where indicated, spring return type motors are to be provided. Valve motors to be 2-position or proportional, spring return or now spring return.

E. Time Clocks:

1. TC-1: Time clock shall be solid-state digital electronic type capable of 28 on/off set points to be distributed through the week, complete with a day repeat feature, time and set points to be adjustable to nearest minute with a minimum on duration of one minute and a maximum of 7 days. UL Listed, enclosed in standard case NEMA Type 1, Intermatic, Tork, Paragon, or equal, with battery operated carry-over.

2. TC-2: Interval timer (bypass), except for window units, shall be manually set and spring operated type, 0 to 6 hours, and without hold feature. Provide Intermatic, M.H. Rhodes, Paragon, or equal.

3. TC-3: Bypass timer for window type air conditioner units shall be DPDT switch configuration, 12 hours, and without hold feature. Provide M.H. Rhodes, Intermatic, Tork, or equal. Provide double gang box as specified in Division 26: Electrical.

F. Wiring: Wiring in connection with control systems regardless of voltage, except power supply circuits, is part of the Work of this Section. Wiring shall comply with Division 26: Electrical.

G. See Section 23 0923 for DDC/Electronic controls.

PART 3 - EXECUTION

3.1 TEMPERATURE CONTROL SYSTEM INSTALLATION

A. Control system shall be installed in accordance with control manufacturer's instructions and reviewed Shop Drawings.

3.2 CONTROL PANELS OR CABINETS

A. Switches, clocks, temperature control instruments, and remote bulb thermometers, whose capillary tubes are less than 25 feet in length, shall be mounted in control panels with required wiring, piping, and tubing behind panel. Control panels shall be galvanized steel sheet metal, with light gray hammertone enamel finish, not lighter than 14 gage. Control panels shall be UL Listed. Panels shall be attached to wall at locations indicated, or as required.

Adjustable apparatus shall be provided with P-Touch, or equal, labels to indicate function. A clear space of 30 inches in front shall be maintained.

B. Control cabinets shall be provided with door locks. Door locks shall be the flush type, latched, 5/8 inch for metal door, keyed to a Corbin Cat. No. 60 key. Cabinet shall be prime coated and finish painted as specified in Section 09 9000: Painting and Coating. Cabinet shall be flush mounted.

3.3 NOT USED.

3.4 ROOM THERMOSTAT

A. Room thermostats shall be wall mounted at a height of approximately 4 feet. Room thermostats are not permitted on outside walls, at marker boards, between shelving, in recesses or above heat producing equipment. Units shall be installed as close to edge of tack board as possible. Room thermostats shall be furnished with tamperproof cover. Thermostats shall be furnished with set point windows and integral thermometers. Office thermostats shall be furnished with extended adjustment knobs; others shall have key adjustments. Room thermostats shall be furnished with non-switching sub-bases.

3.5 COORDINATION

A. Coordinate this Work with other aspects of system balancing to obtain a complete operating mechanical system in accordance with design intent, including coordinating with balancing of the system.

B. Coordinate this Work with all aspects of alarm, fire alarm, and smoke detector, specified in Division 26: Electrical.

3.6 SEQUENCE OF OPERATION

A. Each system, electric, electronic, or direct digital control shall operate as graphically and described on Drawings and in accordance with reviewed sequence of operation.

3.7 CONTROL SYSTEM ADJUSTMENTS

A. Perform adjustments under operating conditions to provide sequence of operation for controls indicated. If required operating conditions cannot be obtained before Substantial Completion, due to outdoor seasonal temperatures, return to the Project site when requested by the Owner and readjust control system when outdoor temperatures will permit proper operating conditions.

Start readjustment within seven calendar days after notification. Final settings of controls and pressure ranges indicated by gages shall be indicated on project record documents.

3.8 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.9 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

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SECTION 23 30 00

AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 09 9000: Painting and Coating.
3. Section 23 0500: Common Work Results for HVAC.
4. Section 23 0800: HVAC Systems Commissioning.
5. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
6. Section 23 0700: HVAC Insulation.
7. Section 23 8000: Heating, Ventilating and Air Conditioning Equipment.

1.2 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Manufacturer's Data:

1. Complete list of items to be furnished and installed under this Section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.
2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements, including allowances for servicing, and other data. Data shall include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that function as parts of an integrated system shall be furnished at one time.
4. Submit complete acoustical test reports showing that proposed products have been tested in accordance with latest editions of relevant ASHRAE and AHRI Standards (ANSI/ASHRAE Standard 70 for air inlets and

outlets; ANSI/ASHRAE Standard 130 and AHRI 880 for terminal units) and will be suitable for operation in Project spaces with specified maximum noise criteria (NC) requirements. The results of all testing shall be certified by an independent testing agency and submitted to the ARCHITECT for approval. The submittal shall include a complete description of the test conditions, methods and procedures.

5. Submittals shall include a tabulation of proposed products, identification of Project spaces where proposed products are to be installed, maximum allowable NC for all Project spaces, and product NC (at specific design air volume) for all Project spaces.
6. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:

    a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts.
    b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.
    c. Typical details of supports for equipment and ductwork.

1.3 QUALITY ASSURANCE

A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 230500: Common Work Results for HVAC.

B. Sound power level measurements and Manufacturers' NC value calculations shall be conducted in complete accordance with the latest version of ANSI/ASHRAE Standards 70 and 130 and AHRI 880.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with provisions stated in Section 230500: Common Work Results for HVAC.

B. Ensure ducts are clean and free of dirt, dust, moisture, oils and other contaminants that can lead to poor air quality. Cover openings of ductwork with a self-adhering protective film. Film shall not leave a residue on metal after removal, and shall be highly resistant to tears and punctures.

1.5 COORDINATION

A. Coordinate activities in accordance with provisions of Section 230500: Common Work Results for HVAC.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise noted, provisions, including amendments thereto, of the latest edition of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this Section.

B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA.

C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.

D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A653 and A924.

E. Galvanized steel ducts gage thickness and permissible joints and seams of ductwork shall conform to requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC unless noted otherwise on the drawings. The more stringent requirements shall prevail.

F. Button punch snap-lock seams, using Lockformer or equal, shall be permitted only in concealed areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

G. Ducts shall be reinforced in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards: Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.

H. Round and Oval Galvanized Steel and Aluminum Ducts:

1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints.

Fittings shall be furnished with continuous corrosion-resistant welds. Provide gages of ducts and fittings recommended by manufacturer.

2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.
3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.
4. Minimum duct wall thickness, and permissible joints and seams of ductwork for flat oval duct construction shall conform to requirements in the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC. The more stringent requirements shall prevail.
5. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.

I. Flexible Ducts

1. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1 ½-inch thick fiber glass insulation (K = 0.25 at 75 degrees F), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly, including insulation and vapor barrier, comply with NFPA Standard 90A or 90B and tested in accordance with UL Standard, UL 181. Non-insulated metallic ducts shall be provided for exhaust only.
2. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.
3. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.

J. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etcetera, shall conform to applicable provisions of this Section or SMACNA manual.

K. Duct Seam and Joint Sealant: Provide sealant for metal ducts at duct joints which are defined as transverse joints between duct sections including girth joints, branch and sub-branch intersections, duct collar tap-ins, fitting subsections, louver and air terminal connections, access doors and frames, and abutments to building structure. Also provide the same at duct seams which are defined as longitudinal joint between duct sections. Spiral lock seams in factory fabricated round or oval ducts are excluded.

1. Sealant for low-pressure ducts shall be: Design Polymerics DP1010 or DP1020, Childers CP-145A/CP-146 Chil-Flex, Foster's 32-19 Duct-Fas,

Miracle-Kingco Glenkote Seal-Flex, Ductmate Industries PROseal or FIBERseal, or equal.

2. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.
3. Sealant materials shall comply with the flame spread and smoke developed rating of current CMC when tested in accordance with ASTM E84.
4. Sealant for exposed to weather ducts shall pass the Weather Resistance Test per ASTM G154 at 2000 hours QUV.

L. Restrictions:

1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.

2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.2 DAMPERS

A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD35, Pottorff MD-42, Greenheck MBD-15 or equal.

2. VD-2, Round: Frame shall be constructed of not less than 20 gage galvanized steel, blades of not less than 20 gage galvanized steel channel construction with factory neoprene seals, ½ inch diameter axle shafts and locking hand quadrant. Ruskin MDRS25, Greenheck MBDR-50, or equal.

3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than ½ inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO25, or equal.

B. Motorized Volume Control Dampers:

1. MVD-1, Rectangular: Multi-blade type opposed blade operation, 16 gage minimum steel channel frame construction; 16 gage galvanized steel blades center pivoted on ½ inch diameter steel trunnions. Interlocking edges. Dampers shall be in own angle frame. Full duct size as indicated on the Drawings. Provide with matching two position motorized actuator with linkages, 24VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CD35, Pottorff CD-42, Greenheck VCD Series, or equal.

2. MVD-2, Round: Butterfly type constructed with minimum 20 gage galvanized steel frame with steel angle reinforcement on above 20-inch diameter. Blade shall be 14 gage minimum thickness. Neoprene seal to ensure air tightness in closed position. Furnish with matching two position motorized actuator with linkage 24 VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CDRS25, American Warming and Ventilating (AMV) VC-25, Air Balance, Inc. AC530, or equal.

3. Electronic Damper Actuators: Belimo, Honeywell, Invensys, or equal.

    a. Sized for torque required for damper seal at load conditions.
    b. Coupling: V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or set screws are not acceptable.
    c. Overload Protection: Microprocessor or an electronic based motor controller providing burnout protection if stalled before full rotation is reached. Actuator shall be electronically cut off at full open to eliminate noise generation with the holding noise level to be inaudible.
    d. Power Requirements: As indicated on Drawings.
    e. Actuator Timing: Shall meet 15 seconds.
    f. Temperature Rating: Actuator shall have a UL 555S listing by damper manufacturer for 350 F.
    g. Auxiliary Switches: Provide for signaling, fan control, and position indications.

C. Automatic Fire Dampers:

1. FD, Fire Dampers: Shall conform to requirements of and be listed by State of California Fire Marshal and NFPA 90A. Dampers shall provide airflow resistance not to exceed 0.05 inch water gage static pressure at 900 fpm or 0.25 inch water gage at 2,000 fpm. Dampers shall be installed in required steel sleeve at each penetration of a rated partition.

    a. Vertical-mounted fire dampers: Fire damper shall be curtain type with blades removed from the air stream to allow for maximum free area. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1 ½ hours for installation in one or 2-hour partitions. Provide UL listed

fusible links of adequate size and temperature rating. Dampers will be installed according to the manufacturer's recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Pottorff VFD-10/VFD-10D Series, Ruskin IBD/DIBD Series, Greenheck FD/DFD Series, or equal.

b. Ceiling fire dampers: Ceiling fire dampers shall be butterfly type with ceramic material to minimize heat radiation. Dampers shall be rated for one hour and shall be furnished as a part of an integral sleeve ceiling box that will accept air distribution, have a UL listed and pre-mounted hanger tabs. Dampers shall be installed according to the manufacturers recommended installation instructions. Pottorff CFD-15 Series, Ruskin CFD Series, Greenheck CRD-1 Series/CRD-2, or equal.

c. Combination fire and smoke dampers: Combination fire and smoke dampers shall be louver bladed type. Units shall be tested and listed under UL 555 and UL 555S. Rating 1 ½ hours for installation in one or 2-hour partitions. The seals shall be non-degradable steel to steel. Leakage shall not exceed 15 cfm/sq. ft. at one inch w.g. and shall be tested at 850 degrees F. Dampers shall be capable of being remotely controlled and reset for pressurization and smoke evacuation. Fire-releasing device shall be UL 33 listed melting fusible links. Dampers shall be provided in sleeves with pre-mounted non-stall motor actuators and dual-position indicators for remote annunciation, if required. The complete assembly shall be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. Pottorff FSD-141 with non-stall motor, Ruskin FSD37 or FSD60 with electric fuse link Model EFL 200, with electric non-stall motor, Greenheck FSD Series, with non-stall motor, or equal.

2. Electronic Damper Actuators: Refer to Sub-paragraph 2.04.B.3.

D. Relief Dampers: Parallel multi-blade, counter balanced type with adjustable counter weights. Constructed of 20 gage galvanized sheet steel or extruded aluminum with solid stops all around. Bearings shall be dust proof, ball bearings. Damper shall open on a positive pressure of 0.01 inch within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Inc., Pottorff, Ruskin, Metal Form Manufacturing Co. Inc., or equal.

E. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified

in this Section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed to be suitable for installation in systems of up to 5 inches water gage static pressure.

2.3 AIR DISTRIBUTION DEVICES

A. General:

1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with ANSI/ASHRAE Standard 70 including airflow velocity, pressure, temperature, and sound measurements.

2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.

3. The noise generating characteristics of all specified grilles, registers, and diffusers shall be tested to, and comply with, all requirements of this specification. Representative samples shall be subjected to tests in accordance with applicable standards and procedures in order to demonstrate such compliance. A special test for this project is not required if the manufacturer has previous certified test results that can be made applicable to this project. Maximum Sound Levels of diffusers, grilles and registers shall be as follows:

Administrative office area:	NC 30
Classrooms:	NC 20
Libraries and other noise sensitive areas:	NC 25
Gymnasiums, cafeterias, lockers areas:	NC 30

4. Provide suitable frame types to match the ceiling types as specified or indicated on the Architectural Drawings.

5. Ceiling diffusers shall be provided with equalizing grids.

6. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.

7. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09 9000: Painting and Coating.

8. Do not provide opposed blade dampers at diffusers and registers to balance the airflow, as they tend to create noise. Provide a manual

volume damper at each branch take-off and also at branch duct to each diffuser and register upstream of the flexible duct connections. Air throw patterns shall be as indicated on the drawings.

9. Diffusers, registers and grilles indicated or scheduled on the drawings to comply with special requirements shall take precedence over the standard items specified.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. CD-1 For non-classroom areas of less than 10 feet ceiling height only. Units shall be square or rectangular modular core type as indicated on the drawings. Anemostat QC Series, Krueger Model 1240, Price SMCD Series, or equal.

2. CD-2 For typical classrooms. Units shall be square plaque type. Anemostat PG Series, Krueger Model PLQ, Price SPD Series, or equal. The horizontal air discharge pattern shall be 360-degree radial type with factory installed blank-offs for three way, two way corner, two way opposite, or one way discharge pattern.

3. CD-3 For non-classroom areas of higher than 10 feet ceiling height. Units shall be square or rectangular louver faced type. Anemostat D Series, Krueger Model SH, Price SMD/AMD Series, or equal.

4. CD-4: Units shall be round, adjustable pattern, and surface-mounted type. Anemostat C-27, Krueger RM Series, Price RCDE Series, or equal.

5. CD-5: Units shall be adjustable linear slot type. Anemostat SLAD Series, Krueger Model 1900, Price AS Series, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. GR-1 Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle, ½ inch spacing and flush and flanged for surface mounting. Anemostat S3HD Series, Kruger Model S80/S85, Price 500/600 Series, or equal.

2. GR-2 Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set at straight or 45 degree angle, ½ inch spacing and flush, lay-in panel type with nominal overall dimension of 24-inch by 24-inch. Anemostat Type SAC3L Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

D. Registers, Supply, Return, Wall:

1. WR-1: Sidewall supply register shall be double deflecting type with loose key-operated opposed blade volume control. Anemostat S2 Series, Krueger Model 80/880, Price 500/600 Series, or equal.

2. WR-2: Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting and complete with loose key-operated opposed blade volume control. Anemostat S3 Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

2.4 SMOKE DETECTORS

A. Refer to Section 28 3100: Fire Detection and Alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 DUCTWORK

A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this Section or on Drawings. In event of conflict, the most stringent requirement shall be provided.

B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.

C. Duct dimensions indicated are net inside dimensions.

D. Where aluminum is welded, provide a minimum thickness of 16 gage, and use gas inert tungsten process of welding.

E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed as required by the latest edition of the SMACNA guidelines.

F. Construct and install ducts to be completely free from vibration under operating conditions.

G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.

H. Attach supports only to building structural framing members and concrete slabs.

I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.

J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 230700: HVAC Insulation.

K. Ducts exposed to weather shall be prefabricated double wall type from HVAC equipment through building envelope.

L. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.

M. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.3 DUCT CONSTRUCTION

A. Minimum ductwork gages, joints, reinforcing, and bracing of ductwork shall conform to SMACNA and CMC. The most stringent standards shall prevail. Additional bracing shall be provided to prevent objectionable panel vibration.

B. Button punch snap-lock seams, using Lock-former or equal, shall be permitted only in non-accessible areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

C. Provide longitudinal seams of the grooved snap lock, or Pittsburg and standing, sealed spiral or continuously welded.

D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one

heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.

E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs.

G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.4 DUCT ELBOWS AND TURNING VANES

A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.

B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.

C. Turning vanes shall conform to SMACNA and CMC.

3.5 DUCT JOINTS AND SEAMS

A. Conditioned air supply ducts shall be furnished with joints and seams sealed, welded for air tightness, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws.

B. Other ducts shall be furnished with joints and seams sealed by using sealant, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.

C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork.

D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

E. Seams around fan, coil housing and plenums shall be sealed with gaskets or sealing compound to provide an airtight assembly.

F. Stainless steel ductwork connected to range hoods and fume hoods shall be provided with grease-tight, gas tight welded seams, and shall be constructed and installed so that grease or other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Gasketed flanged joints with sealing compound shall be used only at fan and fume hood connections.

G. Alternative duct connectors such as Ductmate Industries, Mez Industries, or equal may be used if the following conditions are met:

1. One of the specifically listed connectors is submitted and approved by the ARCHITECT and OAR.

2. The correct size connector, application, and gage of material conform to SMACNA Standards.

3. The connector is installed per manufacturer's specifications.

3.6 DUCT TRANSITION

A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the ARCHITECT.

3.7 DUCT TEST HOLES

A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.8 SOUND ATTENUATING EQUIPMENT

A. Install sound attenuators where required and indicated on Drawings. Refer to manufacturer's instructions for required installation.

3.9 FLEXIBLE CONNECTIONS

A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duro Dyne Durolon, Ventfabrics Ventglas, Ductmate

Industries Proflex, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline shall be less than 5 percent of diameter or shortest dimension of a rectangular inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.10 AIR TERMINAL DEVICES

A. General: Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces, and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

B. Diffusers: Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings with hanger wires from each corner and not supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.

2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.

3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.11 DAMPERS

A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Provide and install manual volume dampers per SMACNA standards to allow balancing per AABC, NEBB or TABB Procedures and Standards whether indicated on the drawings or not.

2. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where two or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

3. Each supply, return, and exhaust branch shall be provided with manual volume dampers.

4. Do not provide opposed blade dampers at air inlets and outlets.

5. Each supply, return, and exhaust inlet or outlet shall be provided with a manual volume damper. This damper shall be a minimum of 5 feet upstream of the air outlet and inlets. An acoustic flexible duct should be provided between the outlet and inlet and the damper for concealed ducts.

6. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventfabrics Ventlok, Duro Dyne, Young Regulator Co., or equal.

7. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventfabrics Ventlok, Young Regulator Co., Duro Dyne, or equal.

8. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall not be greater than 9 inches. Dampers shall be not less than 18 gage steel.

9. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 23 0900: HVAC Instrumentation and Controls.

10. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators

shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the ARCHITECT.

11. Dampers shall not be installed in combustion air ducts.

12. Access panels shall be installed for access at each damper's operating mechanism.

3.12 FIRE AND SMOKE DAMPERS

A. Fire dampers or combination fire and smoke dampers shall be installed and accessible at duct penetrations of rated walls and partitions and as required by State Fire Marshal and NFPA 90A, 92A, 92B, and 101.

B. Fire dampers shall be sized, and adjoining duct enlarged, to assure full size air passage of connecting ductwork.

C. Install smoke dampers as indicated on Drawings and as required in ducts penetrating smoke isolation separations.

D. Fire dampers or combination fire and smoke dampers shall be electrically actuated, power open-fail close type, UL 555 and UL 555S classified for 1-1/2 hours.

E. Provide a service disconnect switch for each and every combination smoke and fire damper.

3.13 DETECTORS

A. Smoke detectors shall be installed in accordance with requirements of the California Mechanical Code.

B. Smoke detectors shall be installed in systems of over 2000 CFM capacity to detect presence of smoke and automatically shut down air handling units or fans unless it has been verified with the electrical installer that Exception 1 to CMC 609.0: Automatic Shutoffs, regarding automatic shutdown of systems with total coverage smoke detection systems is applied.

C. Smoke detectors shall be installed in supply system downstream of filters.

3.14 BACKDRAFT DAMPERS

A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Building Energy Efficiency Standards, Title 24, CCR.

3.15 DUCT SLEEVES AND PREPARED OPENINGS

A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.

B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.

C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.

D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.

E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.16 FLEXIBLE DUCT RUNOUTS

A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.17 DUCT HANGERS AND SUPPORTS

A. Exposed or easily accessible ductwork: All exposed ducts shall be supported by all-thread Rod as a single hanger and or a trapeze support for rectangular duct work in accordance with requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA.

B. Non-accessible ductwork: Non-exposed and hidden from sight during regular school operations ductwork, rigid round, rectangular, and flat oval metal ducts, shall be installed with support systems conforming to SMACNA Standards.

C. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1 ½-inch by 1 ½-inch by 1/8 inch for duct sizes through 60 inches in greatest dimension, 2-inch by 2-inch by 1/8 inch for duct sizes 61 inches through 84 inches, 2-inch by 2-inch by 3/16 inch for duct sizes 85 inches through 96 inches, and 2-inch by 2-inch by 1/4 inch for duct sizes over 97 inches.

D. Ducts six square feet area and greater and or minimum 28” round or greater shall be seismically restrained. Refer to Section 23 0548: HVAC Sound, Vibration and Seismic Control.

E. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.

F. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized and installed according to SMACNA Standards for required span so that they will be rigid, without bending or sagging.

G. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, fastened to roof structure, flashed and sealed to roof membrane. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general. Pitch pockets are not allowed.

3.18 ACCESS PLATES AND DOORS

A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment, lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.

B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access plates shall be no less than 12-inch by 12-inch in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24-inches by 24-inch, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.

C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.

D. Access plates in floors shall not be less than 8-inch by 8-inch and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.

E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.

F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.

G. Access panels shall be fire-rated; Milcor, or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with two keys each, instead of Allen headlock for non-rated ceilings.

H. Access panels that are part of an integrated ceiling are specified in Section 09 8433: Cementitious Wood Fiber Acoustical Units. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.

I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.

J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.

K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.

L. Label the words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.

M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed five keys for any one Project.

N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.

O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.

P. Refer to SMACNA for access plate and door construction.

3.19 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.20 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

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SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall round ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

1. Static-Pressure Classes:

a. Exhaust Ducts (Negative Pressure): 1-inch wg.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Factory- and shop-fabricated ducts and fittings.

3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.

4. Elevation of top of ducts.

5. Dimensions of main duct runs from building grid lines.

6. Fittings.

7. Reinforcement and spacing.

8. Seam and joint construction.

9. Equipment installation based on equipment being used on Project.

10. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

11. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.

2. Joint and seam construction and sealing.

3. Reinforcement details and spacing.

4. Materials, fabrication, assembly, and spacing of hangers and supports.

5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

2. Suspended ceiling components.

3. Structural members to which duct will be attached.

4. Size and location of initial access modules for acoustical tile.

5. Penetrations of smoke barriers and fire-rated construction.

6. Items penetrating finished ceiling including the following:

   a. Lighting fixtures.

   b. Air outlets and inlets.

   c. Sprinklers.

   d. Access panels.

   e. Perimeter moldings.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.

3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. Mockups:

1. Before installing duct systems, build mockups representing static-pressure classes in excess of 3-inch wg. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

    a. Five transverse joints.

    b. One access door(s).

    c. Two typical branch connections, each with at least one elbow.

    d. Perform leakage tests specified in "Field Quality Control" Article. Revise mockup construction and perform additional tests as required to achieve specified minimum acceptable results.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

    a. Lindab Inc.

    b. McGill AirFlow LLC.

    c. SEMCO Incorporated.

    d. Sheet Metal Connectors, Inc.

    e. Spiral Manufacturing Co., Inc.

    f. Or Equal.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter (diameter of the round sides connecting the flat portions of the duct).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.

2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.

4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

5. Shop-Applied Coating Color: Black.

6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements:

1. Duct Mastic shall be used at all duct joints and seams.

2. Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 6 inches (152 mm).

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.

7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.

4. Water resistant.

5. Mold and mildew resistant.

6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.

8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Base: Synthetic rubber resin.

3. Solvent: Toluene and heptane.

4. Solids Content: Minimum 60 percent.

5. Shore A Hardness: Minimum 60.

6. Water resistant.

7. Mold and mildew resistant.

8. VOC: Maximum 395 g/L.

9. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive or negative.

10. Service: Indoor or outdoor.

11. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.

3. Grade: NS.

4. Class: 25.

5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.

2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.4 HANGERS AND SUPPORTS

A. Duct supports shall be per DSA approved drawings.

B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

C. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

D. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

E. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

F. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

G. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

H. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

I. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.5 SEISMIC-RESTRAINT DEVICES

A. Shall be per DSA approved plans.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and

arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

1. For static-pressure classes 1- and 1/2-inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:

    a. Systems for residential occupancy.

    b. Ducts that are located directly in zones they serve.

B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

1. For static-pressure classes 1- and 1/2-inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:

    a. Systems for residential occupancy.

    b. Ducts that are located directly in zones they serve.

3.3 HANGER AND SUPPORT INSTALLATION

A. Attachment of duct supports shall be per DSA approved drawings.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain

B. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Set anchors to manufacturer's recommended torque, using a torque wrench.

5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."

2. Test the following systems:

   a. Exhaust air.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

4. Test for leaks before insulation application.

5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.

2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.

3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.

4. Coils and related components.

5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.

7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.

7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as follows:

1. Moist Environment Ducts: Aluminum.

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

2. Stainless-Steel Ducts: Galvanized steel.

3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

C. Elbow Configuration:

1. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

D. Branch Configuration:

1. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.

    b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.

    c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

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SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft dampers.
2. Flange connectors.
3. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

    a. Special fittings.
    b. Wiring Diagrams: For power, signal, and control wiring.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

C. Source quality-control reports.

D. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.2 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

C. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Building Energy Efficiency Standards, Title 24, CCR.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff
2. Ruskin
3. Or equal

B. Relief Dampers: Parallel multi-blade, counter balanced type with adjustable counter weights. Constructed of 20 gage galvanized sheet steel or extruded aluminum with solid stops all around. Bearings shall be dust proof, ball bearings. Damper shall open on a positive pressure of 0.01 inch within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Inc., Pottorff, Ruskin, Metal Form Manufacturing Co. Inc., or equal.

2.3 DAMPERS

A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Provide and install manual volume dampers per SMACNA standards to allow balancing per AABC, NEBB or TABB Procedures and Standards whether indicated on the drawings or not.
2. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where two or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.
3. Each supply, return, and exhaust branch shall be provided with manual volume dampers.
4. Do not provide opposed blade dampers at air inlets and outlets.
5. Each supply, return, and exhaust inlet or outlet shall be provided with a manual volume damper. This damper shall be a minimum of 5 feet upstream of the air outlet and inlets. An acoustic flexible duct should be provided between the outlet and inlet and the damper for concealed ducts.

6. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventfabrics Ventlok, Duro Dyne, Young Regulator Co., or equal.
7. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventfabrics Ventlok, Young Regulator Co., Duro Dyne, or equal.
8. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall not be greater than 9 inches. Dampers shall be not less than 18 gage steel.
9. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 23 0900: HVAC Instrumentation and Controls.
10. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the ARCHITECT.
11. Dampers shall not be installed in combustion air ducts.
12. Access panels shall be installed for access at each damper's operating mechanism.

2.4 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 10-inch wg (2500 Pa).
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.5 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0428-inch (1.1-mm) stainless steel.

D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.6 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches (146 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. 3um Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.7 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.

2. Downstream from manual volume dampers, control dampers, and equipment.
3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. At each change in direction and at maximum 50-foot (15-m) spacing.
5. Upstream of turning vanes.
6. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

I. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

L. Install duct test holes where required for testing and balancing purposes.

M. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

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SECTION 23 80 00

HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Air conditioning and air handling equipment including but not limited to:

1. Split System Heat Pump Units.
2. Fans.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 07 6000: Flashing and Sheet Metal.
3. Section 22 1000: Plumbing.
4. Section 23 0500: Common Work Results for HVAC.
5. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
6. Section 23 3000: Air Distribution.

1.2 DESIGN REQUIREMENTS

A. Work of this Section is based on HVAC equipment units indicated as Basis of Design in Part 2 of this Section. Products from different HVAC equipment manufacturers listed are never identical, although equivalent in capacity, performance and quality. In the cases where dimensions, weight, configuration and utility requirements differ from the products used as a basis of design, the Contractor, at no additional cost to the Owner, shall coordinate and submit, for Architect review, revisions to the design.

1.3 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. For products listed that are not the basis of design, submit the following in addition to above requirements:

1. Title 24 Calculations: Replace HVAC unit values in calculation files provided by the Architect and submit for review.

1.4 QUALITY ASSURANCE

A. Provide submittals in accordance with Section 23 0500: Common Work Results for HVAC.

1.4 PROJECT RECORD DOCUMENTS

A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.

1.5 WARRANTY

A. Compressors shall be provided with manufacturer's five year warranty, replacement only.

B. Manufacturer shall warrant parts, except heat exchangers, for a period of five years.

C. Heat exchangers shall be provided with manufacturer’s ten year warranty, replacement only.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.

2.2 HEAT PUMP AND FAN COIL UNITS

A. Manufacturer: Mitsubishi, Carrier, Trane, York, Lennox, American Standard Heating & Air Conditioning, or equal.

1. Basis of Design: Mitsubishi

B. HP and matching indoor fan coil unit and condenser unit: Furnish heat pump, split type, air-cooled, roof or ground installation with ducted connections or free blow. Units shall be air-cooled heat pump/direct expansion fan coil combinations. Heat pump outdoor section shall be factory assembled and furnished with direct-drive condenser fans with horizontal or vertical air discharge, scroll type compressor, refrigerant coil, fan motors, pre-wired control panel. Unit shall also be provided with a fully piped refrigerant circuit, fully charged with an environmentally friendly refrigerant that is not scheduled for phase out. Provide additional refrigerant for extended lines. Indoor fan coil unit shall be furnished with horizontal discharge and will include evaporator coil, fan and motor, condensate pan with drain, thermal expansion valve, pre-wired control panel and remote thermostat control. Nominal unit cooling, heating capacities, electrical characteristics, and operating conditions shall be as indicated on Drawings.

C. Quality Assurance:

1. Cooling capacity rated in accordance with current AHRI Standard 210/240 and 270. Units shall be listed in AHRI.

2. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with NEC.

3. Units shall be constructed in accordance with UL standards and shall carry UL label of approval. Units shall have CSA approval.

4. Units shall be listed in CEC directory.

5. Unit cabinet shall be capable of withstanding ASTM B117 500 hour salt spray test.

6. Unit shall provide an EER/SEER/COP complying with CCR, Title 24, Building Energy Efficiency Standards and per the drawings.

D. Evaporator and condenser coils: Evaporator and condenser coils shall be copper with mechanically bonded, smooth aluminum plate fins. Tube joints shall be brazed with copper or silver alloy. Coils shall be pressure-tested at factory. Protective metal guard for inlet and outlet of outdoor coil.

E. Fans:

1. Condenser Fan and Motors: Condenser fan shall be ECM type motor direct driven, propeller type arranged for horizontal or vertical discharge. Condenser fan motors shall be furnished with inherent protection, and shall be permanently lubricated type, resiliently mounted for quiet operation. Each fan shall be furnished with a safety guard.

2. Evaporator fan section shall be furnished with ECM type motor centrifugal, forward curved, double width, double inlet fan or fans installed on a solid shaft. Fan shall be statically and dynamically balanced and shall rotate on permanently lubricated bearings.

F. Unit Cabinets:

1. Cabinets shall be fabricated of galvanized steel, bonderized and finished with baked enamel.

2. Cabinet interior shall be insulated with minimum one inch thick foil face fiberglass.

3. Outdoor unit compartment shall be isolated and have an acoustic lining to assure quiet operation.

G. Compressor: Compressor shall be two stage or variable speed type hermetic scroll.

1. Compressor shall be furnished with access valves and it shall be installed on rubber isolators to reduce sound vibration.

2. Furnish with high and low-pressure protection.

3. Each heat pump shall be furnished with factory installed suction accumulator. Field installed accumulators are not permitted.

4. It shall be furnished with high and low-pressure protection, brass external vapor supply line service valves, vapor return line service valves with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, filter drier, pressure relief, liquid line solenoid valves, thermostatic expansion valves, and a holding charge of refrigerant.

H. Refrigeration Components: Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader type fittings with brass caps, accumulator, bi-flow filter drier, pressure relief, reversing valve, heating mode metering device, and a holding charge of refrigerant.

I. Controls and Safeties:

1. Compressor motor assembly shall be protected with high and low-pressure switches, internal overloads, internal thermostat, internal relief valve, and anti-recycle relay, or time cycle device to prevent rapid cycling of compressor after any off cycle.

2. Control panel shall be pre-wired in unit casing.

3. The control circuit shall incorporate a safety circuit to render refrigerant system (compressor and outdoor air motor) inoperative should there be a loss of airflow or refrigerant.

4. Units shall also be furnished with automatic condenser-fan motor protection, high condensing temperature protection, compressor motor current and temperature overload protection, high pressure relief and condenser fan failure protection.

J. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45 degrees F.

K. Safeties:

1. High condensing temperature protection.

2. Compressor motor current and temperature overload protection.

3. High pressure relief.

4. Outdoor fan failure protection.

L. Filters:

1. Filters shall be 1-inch standard size high capacity replaceable media type, MERV 13, or equal, installed in an external 1-inch rack filter section and complete with an access door.

2. An-line filter-drier shall be furnished with equipment and installed at Project site.

M. Provide programmable digital thermostat with following features:

1. 7-day time clock.

2. Heat, cool, automatic changeover.

3. Occupied / Unoccupied modes.

4. Dry contact switch for input from an external device such as a central time clock, occupancy sensor, or a telephone activated device.

5. Robertshaw, Honeywell, Johnson Controls, Carrier, Schneider Electric, Viconics, or equal with built-in occupancy sensor.

N. Start-up: Factory test each unit before shipment to Project site. Performance test shall include full refrigeration start-up, fan and controls start-up. Each unit shall be provided with its own report with its own serial number. Non-tested units are not permitted to be delivered to Project site. Provide full start-up of units to include full refrigeration and provide a written report.

O. Parts Availability: Submit proof in writing that majority (minimum 80 percent) of replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

2.3 ROOF MOUNTED CENTRIFUGAL EXHAUST FANS

A. RMCEF-1:

1. Manufacturer:

CARNES	GREENHECK	LOREN COOK	PENNBARRY	TWIN CITY & BLOWER	OR EQUAL
VBBB Series	SWB Series	CPS	Dynamo	BCV	

2. Provide single width, single inlet, backward inclined steel wheel, belt driven centrifugal vent sets of sizes, capacities and configurations indicated on drawings, complete with accessories for installation of fans. Also, provide accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear AMCA Certified Ratings Seal for Sound, Air Performance and be manufactured with Type C spark resistant construction.

4. Housing: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper shall be a minimum 14 gage steel with scroll drain and scroll side panels shall be a minimum 12 gage steel. The entire fan housing shall have continuously welded seams for leak proof operation. A performance cut-off shall be furnished to prevent re-circulation of air in fan housing. The fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1 ½-inch outlet discharge flange. Bearing support shall be minimum 10 gage welded steel. Side access inspection ports shall be provided with quick release latches for access to motor compartment without removing weather cover. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate.

5. Finish: Steel fan components shall be an electrostatically applied, baked epoxy powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2.5 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method. Interior and exterior parts of the fan exposed to the air being moved shall be coated with minimum 15 mils of baked epoxy.

6. Wheel: Wheel shall be steel centrifugal backward inclined, non-overloading flat blade type. Blades shall be continuously welded to backplate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to fan shaft. Wheel inlet shall overlap a one piece aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204, Balance Quality and Vibration Levels for Fans.

7. Motor: Motor shall be heavy-duty, explosion proof type with permanently lubricated sealed ball bearings and furnished at specified voltage, phase, and enclosure.

8. Bearing: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty re-greasable anti friction ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

9. Shaft: Blower shaft shall be AISI C1045/SAE 1045 hot rolled steel and accurately turned, ground, and polished. Shafting shall be sized for a critical speed of at least 143 percent of maximum RPM.

10. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to wheel and motor shafts. Drives shall be sized for 150 percent of installed motor horsepower. The variable pitch motor drive must be factory set to specified fan RPM.

2.4 INLINE FANS

A. ILF-1:

1. Manufacturer:

LOREN COOK	OR EQUAL
SQN-B or SQN-D	

2. Fan shall be duct mounted, belt driven centrifugal square inline.

3. Certification: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

4. Housing: The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

5. Finish: Steel fan components shall be coated with polyester powder coating to exceed 1,000 hour salt spray test under ASTM B117 test method.

6. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

7. Motor: Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

8. Shaft: Blower shaft shall be AISI C1045/SAE 1045, or 1040 hot rolled and accurately turned, ground, and polished. Shafting shall be sized for a critical speed of at least 143 percent of maximum RPM.

9. Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy-duty regreasable ball or roller type in a cast iron pillow block housing and selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

10. Drive: Fans shall be direct drive or belt driven as indicated on drawings.

11. Belts and Drives: Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives

shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

2.5 CEILING EXHAUST FANS

A. CEF-1:

1. Manufacturer: Panasonic FV series, or equal.

2. Provide ceiling mounted, direct driven, centrifugal exhaust fans of sizes, capacities and configurations indicated on drawings, complete with accessories for installation of fans. Also, provide accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be listed by Underwriters Laboratories (UL 507 & 705). Fan shall bear AMCA Certified Ratings Seal for Sound and Air Performance.

4. Housing: The fan housing shall be minimum 26 gage galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 16 gage reinforcing channel and shall be easily removable from housing. Motor shall be mounted on vibration isolators. Unit shall be supplied with integral wiring box and disconnect receptacle shall be standard. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided. A powder painted white steel grille shall be provided as standard.

5. Wheel: Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard 204, Balance Quality and Vibration Levels for Fans.

6. Motor: Motor shall be ECM type with permanently lubricated bearings, built-in thermal overload protection and disconnect plug. Motor shall be furnished at specified voltage.

2.6 FILTERS

A. Air filters shall be of pleated, high capacity, disposable type of efficiencies indicated on drawings. Each filter shall consist of a non-woven cotton fabric

media, media support grid, and enclosing frame. Filter shall be UL 900 listed, Class 2.

B. Filter media shall provide an average efficiency as specified on drawings per ASHRAE Standard 52.2.

C. Initial resistance of air filters shall not exceed following limits for each efficiency level at face velocities indicated. Lower resistance requirements, if indicated on drawings shall have precedence.

30 percent (MERV 8)	0.27 inch water gage at 500 feet per minute
75 percent (MERV 11)	0.28 inch water gage at 500 feet per minute
85 percent (MERV 13)	0.30 inch water gage at 500 feet per minute
95 percent (MERV 14)	0.38 inch water gage at 500 feet per minute

D. Use standard size Filter Medias only.

E. Media support shall be a welded wire grid or a rigid frame with an effective open area of not less than 96 percent.

1. Media support shall be bonded to filter media to eliminate possibility of media oscillation and media pull-away.

2. Media support grid shall be formed in such a manner that it effectively forms a radial pleat design, providing total use of filter media.

F. Enclosing frame shall be bonded to air entering and air exit side of each pleat, to ensure pleat stability. Inside periphery of enclosing frame shall be bonded to filter pack, thus eliminating possibility of air bypass.

G. Holding frames shall be factory fabricated of 16 gage galvanized steel, or equivalent and shall be furnished with gaskets and spring type positive sealing fasteners. Fasteners shall be capable of being attached or removed without use of tools.

H. Manufacturers: Camfil Farr, Koch, or AAF.

2.7 LOUVERS, AIR CONDITIONING (use in conjunction with relief damper)

A. Standard steel louvers shall be furnished complete with frames, blades, finish and construction details per Drawings and manufacturer's recommendations.

B. Louvers shall be furnished with horizontal blades, 2 inches deep for air through wall installation in conjunction with gravity relief damper for backdraft protection that will open at 0.01 inch wc room static pressure as indicated on Drawings. Blades shall be 16-gage steel, spaced at 1 7/8-inch at 30 degrees angle, and

with baked epoxy coating. Panel size shall be as indicated but not less than 24 inches width by 18 inches in height.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EQUIPMENT FOUNDATIONS

A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under abnormal conditions imposed upon equipment.

B. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.3 EQUIPMENT DESIGN AND INSTALLATION

A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.

B. Application: Only provide equipment as reviewed by Architect.

C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.

1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.

2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.

3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.4 ROOF-TOP EQUIPMENT MOUNTING

A. Downflow Packaged Units: Install unit on a prefabricated mounting frame or curb secured directly to roof. Follow manufacturers recommended installation manuals. Submit Shop Drawings for review by Architect.

B. Horizontal Flow Packaged Units: Install unit on platform or prefabricated mounting frame or curb secured directly to roof designed to suit roof conditions and requirements of provided unit. Submit Shop Drawings for review by Architect.

3.5 NOISE AND VIBRATION

A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.

B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.6 FIELD TESTS AND INSPECTION

A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 0500: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 0500: Common Work Results for HVAC.

B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.

C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, various strainers or filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 23 0500: Common Work Results for HVAC.

D. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.

E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.7 REFRIGERANT PIPING

A. Unless otherwise indicated, main liquid and suction lines from condensing unit to evaporator coil shall be of sizes specified by manufacturer.

B. Refrigeration piping shall be refrigeration grade copper tubing, type L hard-drawn. In instances where refrigeration lines are installed in an inaccessible location and must be snaked through conduit or a trench, that portion of tubing required to complete connections through conduit or trench may be soft drawn. Maintain entire system clean and dry during installation. Pipe shall be sealed until installed.

C. Refrigeration piping, both hard and soft-drawn, shall be straight and free from kinks, restrictions and horizontal runs shall be sloped towards compressor one inch to 10 feet wherever possible. Vapor line oil traps shall be installed on bottom of vertical risers and inverted oil trap shall be installed on top of vertical risers.

D. Joints shall be installed with Sil-Fos 15, Silvaloy 15, or equal.

E. Flare nuts required on suction lines shall be of short forged or frost-proof type. Other fittings shall be standard sweat-soldered type. Ells and return bends shall be long radius type. Install leak lock material.

F. Refrigeration Piping: Joints shall be silver brazed and leak tested. Field fabricated lines shall be thoroughly flushed and cleaned before connection. Bleed nitrogen through lines during silver brazing, and cap and seal lines when not completed and connected to equipment.

G. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide 24 gage galvanized iron pipe and chrome-plated escutcheon plates.

Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

H. Install insulated couplings at points of connection between dissimilar metals for cathodic protection. Insulate copper tubing from ferrous materials and hangers with 2-inch thickness of 3-inch wide strip, 10 mil polyvinyl tape wrapped around pipe.

I. Support piping by iron hangers and supports. Hydra-Zorb cushion clamps, LSP Products Group Acousto Clamp, or equal, on non-insulated piping, and Klo-Shure coupling clamp on insulated piping, or equal.

J. Provide saddles to protect pipe insulation.

K. Provide connections of copper, copper plated steel, steel, and brass pipe and tubing with Harris Products Group Safety-Silv 56, Lucas-Milhoupt, Inc., or equal, complying with ANSI/AWS A5.8 and NSF 51.

L. Insulate refrigerant suction lines.

M. On split heat pump systems, insulate both vapor and liquid lines. For insulation materials, refer to Section 23 0700: HVAC Insulation.

3.8 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.9 PROTECTION

A. Protect Work of this Section until Substantial Completion.

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SECTION 23 80 01

HEAT PUMP VARIABLE REFRIGERANT FLOW EQUIPMENT

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Related Documents:

1. Division 01: General Requirements.
2. Section 22 1000: Plumbing.
3. Section 23 0500: Common Work Results for HVAC.
4. Section 23 0513: Basic HVAC Materials and Methods.
5. Section 23 0548: HVAC Sound, Vibration and Seismic Control.
6. Section 23 0800: HVAC Systems Commissioning.

B. The heat pump variable refrigerant flow system is a two-pipe system consisting of a single or multiple outdoor units, multiple indoor units of various types and capacities, individual or central indoor unit controls with on/off temperature settings, all connected by fully insulated refrigerant lines utilizing factory supplied, fully insulated, branching kits. Indoor units are connected to condensate piping that shall be terminated to the nearest drain point.

C. The system shall be fully capable of providing heating or cooling as requested by the individual indoor zones that can consist of single or multiple indoor units. The heating priority shall be the default factory setting and can be changed to cooling, majority or a single zone priority.

D. The maximum number of connected indoor units shall not exceed 64.

E. The total connected indoor unit capacity shall range between 50 and 150% of the outdoor unit capacity based on indoor unit type & size selected.

1.2 QUALITY ASSURANCE

A. Units shall be listed by ETL (Engineering Testing Laboratory) and be evaluated in accordance with UL standard 1995, 4th. edition.

B. Units shall be listed in the AHRI directory.

C. All units shall meet the Federal minimum efficiency standards and be tested per AHRI 1230 Standard.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Units shall be shipped in one piece and shall be stored and handled per unit manufacturer's recommendations.

B. Units shall be supplied with a base rail that provides openings for moving the unit by fork truck or rigging the unit by crane.

1.4 WARRANTY

A. Compressors shall be provided with manufacturer's five year warranty, replacement only.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Manufacturers: Toshiba, Mitsubishi, Daikin.

1. Basis of Design: [Toshiba]
2. General: Factory-assembled, single piece air-cooled outdoor unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and the multiple inverter-driven twin rotary compressors.
3. The maximum sound pressure rating for a single module shall not exceed 64 dBA sound pressure in cooling and 65 dBA in heating and for multiple modular systems the sound pressure numbers should not exceed 68 dBA and 69 dBA. Sound pressure ratings are measured at a distance of 3 ft out and 4 ½ ft up from the side of the outdoor unit.
4. The outdoor unit shall include an oversized accumulator and a liquid tank for proper heating performance while allowing the indoor unit PMV (pulse modulating valve) metering device to shut off completely when a zone is satisfied.
5. The outdoor unit shall be protected by a high-pressure switch, high-pressure sensor, low-pressure sensor, fusible plug, PC board, and inverter overload protector.
6. The outdoor unit shall be capable of operating in cooling mode down to 14F ambient air temperature and down to -13 F wet bulb ambient air temperature in heating.

7. The outdoor unit shall include a total oil management system that balances oil between compressors within a module, replenishes compressor oil to the compressors in a module from the oil separator if required, and allows oil and refrigerant to move between multiple modular units if required, even if one of the units is not running.

B. Unit Cabinet:

1. Unit cabinet shall be constructed of pre-coated steel, finished on both inside and outside.
2. Unit access panels shall be removable with minimal screws and shall provide full access to the compressors, fan, and control components.
3. Compressors shall be isolated in a compartment and have an acoustic wrap to assure quiet operation.
4. The outdoor unit control panel shall include a sliding window to access adjustable controls and an LED display for setup and diagnostics.
5. Unit cabinet shall be capable of withstanding 500-hour salt spray test per Federal Test Standard No. 141 (method 6061).

C. Fans:

1. Outdoor fan shall discharge air vertically and be driven by a DC inverter variable speed motor with 64 steps that is capable of running down to 60 rpm.
2. Outdoor fan motor shall be totally-enclosed with permanently-lubricated bearings.
3. Motor shall be protected by internal thermal overload protection.
4. Fan blade shall be non-metallic and shall be statically and dynamically balanced.
5. Outdoor fan shall be protected by a raised non metallic protective grille.

D. Compressors:

1. Each outdoor unit module shall be equipped with two inverter-driven twin rotary compressors with full range control to an accuracy of ±0.1 Hz.
2. Compressor shall be totally enclosed in the machine compartment.
3. Compressors shall be equipped with factory mounted crankcase heaters.
4. Internal overloads shall protect the compressor from over-temperature operation.
5. Motor shall be suitable for operation in an R-410A refrigerant atmosphere.
6. Compressor assembly shall be installed on rubber vibration isolators.
7. To maximize compressor reliability, multiple compressors within a module shall be started and operated in variable patterns to ensure equal run time on all compressors.
8. To ensure maximum efficiency throughout the system operation range, no compressor is required to run at maximum speed under any condition.

E. Outdoor Coil:

1. Coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, which are cleaned, dehydrated, and sealed.

2. The coil configuration shall be 4-sided and fully separated from the machine compartment for more effective heat transfer and sound isolation.

3. The coil fins shall have a factory-applied corrosion resistant blue-fin finish.

F. Controls and Safeties: Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control functions shall include the following:

1. Controls:

a. Compressor speed to match the refrigerant flow and capacity with the system requirements.
b. Outdoor fan motor speed for higher efficiency and lower sound.
c. Oil control for improved system reliability and comfort
d. Pulse modulating valve control for precise control of the refrigerant distribution and accurate capacity management to avoid starving any units.
e. Control of compressor staging to maximize reliability and minimum run time on all compressors.
f. Module control of compressor operation, compressor speed, and outdoor heat exchanger surface to maximize efficiency and sound level and reliability across the entire operating range of the system.
g. Control of the outdoor heat exchanger surface (main vs sub heat exchangers) for maximum efficiency and comfort.

2. Safeties: The following safety devices shall be part of the condensing unit:

a. High-pressure switch
b. Fuses
c. Crankcase heater
d. Fusible plug
e. Overcurrent relay for the compressor
f. Thermal protectors for compressor and fan motor
g. Compressor time delay
h. Oil recovery system
i. Oil level sensor
j. Overcurrent sensor
k. Compressor suction and discharge temperature sensor
l. Compressor suction and discharge pressure sensor

G. Electrical Requirements:

1. All sizes shall utilize 208/230-3-60 or 460-3-60 (V-Ph-Hz) field power supply.
2. Multiple systems shall have separate field power supply to each module.
3. Two-core, standard, shielded low voltage cable shall be required for communication between outdoor and indoor unit.
4. All power and control wiring must be installed per NEC and all local electrical codes.

H. Refrigerant Piping and Line Lengths:

1. Piping connections shall be from the front or the bottom of the unit. The unit shall be capable of operating with maximum connected refrigerant line lengths up to 3281 (ft) actual based on total system capacity and refrigerant amount.
2. The outdoor unit shall have the ability to operate with a maximum height of 230 ft between the outdoor and the lowest indoor unit.
3. The maximum distance between the outdoor unit and the furthest fan coil shall not exceed 623 ft actual or 771 ft equivalent. No line size changes or oil traps shall be required.
4. The system shall be capable of operating when the height difference between the upper and the lower fan coil is 131 ft.

I. Auxiliary Refrigerant Components:

1. All field-supplied copper tubing connecting the outdoor unit to the indoor unit shall use factory-supplied branching kits consisting of either Y joints or headers to ensure even refrigerant flow.
2. To ensure piping flexibility, the system shall allow having Y joints or headers downstream of another header.
3. When combining multiple modules, and in order to maximize efficiency and comfort, a 3/8-in. oil balance line shall be used to allow the flow oil and refrigerant between the two units, even when one of the units is not running.

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SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 07 Section "Roof Accessories."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Parts Only Warranty Period from date of Substantial Completion:

    a. Compressor: Five Years
    b. All other components: One Year

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Mitsubishi Electronics America, Inc.; HVAC Division.
3. Trane Company (The); Unitary Products Group.

B. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.2 CEILING-MOUNTING, EVAPORATOR FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan and integral condensate pump.

D. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Scroll.
2. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F.

H. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection, including auto setting.

D. Automatic-reset timer to prevent rapid cycling of compressor.

E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

F. Additional Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable frequency drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install ground-mounting, compressor-condenser components on polyethylene mounting base.

E. Install roof-mounting compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

F. Install seismic restraints.

G. Install compressor-condenser components on elastomeric isolators. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

H. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

I. Insulate piping per manufacturer’s recommendations and per California Energy Code requirements.

3.2 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup check according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Demonstration and Training."

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DIVISION 26

ELECTRICAL

SECTION 26 02 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Two-winding transformers.
2. Shielded transformers.
3. Autotransformers.
4. Buck-and-boost transformers.

B. Related Requirements:

1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
2. Section 26 05 29 - Hangers and Supports for Electrical Systems.
3. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
4. Section 26 05 53 - Identification for Electrical Systems.

C. Reference Standards:

1. National Electrical Manufacturers Association:

   a. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
   b. NEMA ST 20 - Dry Type Transformers for General Applications.

2. International Electrical Testing Association:

   a. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   b. DOE Standards 10 CFR 431.196

1.3 SUBMITTALS

A. Product Data: Submit outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

B. Test and Evaluation Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

1. Maximum Sound Levels

a. 0-9KVA 40 Sound Level
b. 10-50KVA 45 Sound Level
c. 51-150KVA 50 Sound Level
d. 151-300KVA 55 Sound Level
e. 301-500KVA 60 Sound Level

C. Source Quality Control Submittals: Indicate results of factory tests and inspections.

D. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Record Documentation: Record actual locations of transformers.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section..

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Cutler-Hammer/Eaton.
2. GE Electrical & Distribution.
3. Siemens.
4. Square-D.
5. Or approved equal.

2.2 TWO-WINDING TRANSFORMERS

A. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers ratings as indicated on Drawings.

B. Cores: Grain-oriented, non-aging silicon steel. One leg per phase.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.

D. Provide transformers that are constructed to withstand seismic forces.

E. Materials:

1. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.

2. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

F. Fabrication:

1. Per factory standards.

G. Taps for Transformers Smaller than 3 kVA: None.

H. Taps for Transformers 7.5 to 24 kVA: None.

I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

J. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

K. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with DOE Standards 10 CFR 431.196, efficiency levels.
2. Tested according to NEMA TP 2.

L. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.
3. K-rating is noted in the Drawings. Where no rating is present, the K rating is zero.

M. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize inter-winding capacitance. Where no such requirement is present Electrostatic shielding is not required.

2.3 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate.

2.4 1.11 SOURCE QUALITY CONTROL

A. Production test each unit according to NEMA ST20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify mounting supports are properly sized and located.

3.2 PREPARATION

A. Concrete pads are provided by others.

3.3 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, in accordance with Section 26 05 33, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure, or to bottom of enclosure.

C. Support transformers in accordance with Section 26 05 29.

1. Mount floor-mounted transformers on seismically restrained neoprene pads with .2 inches deflection or suitable for isolating transformer noise from building structure.

D. Provide seismic restraints.

E. Install grounding and bonding in accordance with Section 26 05 26.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.2.1.

3.5 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

3.6 CLEANING

A. Clean existing transformers to remain or to be reinstalled.

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SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. ELECTRICAL EQUIPMENT coordination and installation.
2. SLEEVES for raceways and cables.
3. SLEEVE SEALS.
4. GROUT.
5. COMMON ELECTRICAL installation requirements.
6. TESTING for electrical systems.
7. COMMISSIONING of electrical systems.
8. ARC FLASH labeling and electrical hazard.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 07 Section "Penetration Firestopping", for electrical penetration firestopping requirements.

C. Division 07 Section "Joint Sealants", for electrical penetration waterproofing and sealing.

D. Division 09 for Painting and Coatings for Electrical Systems not specifically mentioned herein.

E. Section 26 05 33, "Raceways and Boxes for Electrical Systems", for raceways.

F. See Section 26 05 63, "Electrical Testing", for line voltage system acceptance testing.

G. See Section 26 08 00, "Commissioning of Electrical", for electrical system commissioning requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data:

1. Sleeve seals.
2. Fireproofing material and assemblies, when provided by Electrical.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames”.

D. Coordinate sleeve selection and application with selection and application of fire stopping specified in Division 07 Section "Penetration Fire Stopping".

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.2 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated “wall pipe,” equivalent to ductile-iron pressure pipe, with plain ends, unless otherwise indicated. Where an integral water stop is not provided with the cast-iron sleeve, provide suitable water stopping system for the installation.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.3 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.

2. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Drawings or comparable products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
   e. Link Seal.

3. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
4. Pressure Plates: Carbon steel. Include two for each sealing element.
5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Comply with the requirements of this section when not superseded by a separate Division 26, 27 or 28 Specification Sections.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit, device or flush-mounted junction box for wall-mounting items. In the event of a conflict between the electrical and architectural drawings with regards to device location, placement or elevation, the latest version of the architectural or electrical drawings shall prevail.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Location of Work: All electrical work shall be installed according to the Federated Construction Model. The Model shall define the location and coordination of multiple trades in a given area and shall prevail when resolving installation conflicts.

G. Relocation of Work Due To Installation Conflict: The location of the electrical systems has a profound impact on the amount of hazardous electrical energy that a construction worker or facility operator may experience. Electrical work previously designed, modeled, coordinated and set in place in the Construction Model shall not be moved without written approval by the Electrical Engineer of Record (EEOR).

H. Right of Way: Give to sloped piping systems installed at a required elevation only. No right of way shall be offered to any systems or equipment not located per the Construction Model or installed in variance with the Construction Model.

3.2 TESTING AND COMMISSIONING

A. Upon completion of the electrical construction work, perform tests and provide test reports as specified in this and other sections.

B. See Section 26 05 63, “Electrical Testing”, for line voltage system acceptance testing.

C. See Section 26 08 00, “Commissioning of Electrical”, for electrical system commissioning requirements.

D. Submit to the Owner or General Contractor posted electronically to the project’s collaboration and file sharing/storage website copies of test results, certified in writing, witnessed, signed and dated, immediately upon completion of work. Unsatisfactory condition revealed by these test results, or unsatisfactory methods of tests and/or testing apparatus and instruments, shall be corrected by Rosendin to the satisfaction of the General Contractor or Owner. Where a project collaboration and file sharing/storage website is not used, provide one (1) PDF copy of all test reports to the Owner or General Contractor.

E. Perform that are defined in Division 26, Electrical only. Any further testing required by Authority Having Jurisdiction (AHJ) is part of the contract and shall be performed by the Contractor without additional charges to the Owner.

F. Testing or commissioning failures are judged solely by either National Electrical Testing Association (NETA) published standards and protocols, the

requirements of the Electrical Specifications or by testing scripts written by the third-party Commissioning Agent.

G. A “Fail” in any electrical test or commissioning script are judged by these Specifications, Contract Documents, and accepted testing scripts only.

H. Correct unsatisfactory portion of their work that is revealed by the tests or that may be due to progressive deterioration during this period, unless the item in question was a direct specification, and solely according to the warranty carried for this project.

3.3 GENERAL INSTALLATION METHODS

A. Carpentry, Cutting, Patching, and Core Drilling:

1. Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in the scope of work.
2. Do not cut, core or drill existing structural members without consent of the Rosendin Project Manager and Structural Engineer of Record (SEOR). Do not cut, core or drill structural new members nor weld ears, extensions or appurtenances to new structural members in variance with the Structural Drawings or Structural Steel Shop Drawings without the consent of the Rosendin Project Manager and Structural Engineer of Record (SEOR).

B. Firestopping:

1. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
2. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
3. Description: Firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to achieve the design fire resistivity of the proposed assembly or to restore original fire-resistance rating of an existing wall or floor.

    a. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping".
    b. Whether or not the fire stopping materials are indicated in the Drawings or in Division 07 Section "Penetration Firestopping", all fire stopping materials shall be provided in accordance with all definitions of the UL Fire Resistance Directory, current edition, without exception.

c. All assemblies, whether they be installed as a system or compiled into a system from parts, sealants and various materials, shall render a UL-conforming fire stopping assembly suitable to the AHJ.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.

5. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Drawings or comparable products by one of the following:

   a. 3M Corp.
   b. Hilti.
   c. STI Fire Stop.
   d. Therma Fiber/US Gypsum.
   e. Tremco.
   f. Or approved equal.

C. Waterproof Construction:

1. NEMA 3R shall be the water resistivity rating for all boxes, devices and enclosures for equipment or devices mounted outside or otherwise exposed to the weather, unless otherwise noted in the Specifications for specific installations and uses. See Drawings and Section 26 05 33, “Raceways and Boxes for Electrical Systems”, for all NEMA installation requirements.
2. See Division 07 for Thermal and Water Protection for Electrical Systems not specifically herein mentioned.
3. Maintain waterproof integrity of penetrations of materials intended to be waterproof where Electrical is responsible for waterproof penetrations and waterproofing of their work.
4. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work. Roof penetration means and methods shall be in complete compliance with the roof manufacturer’s warranty and requirements to maintain the roof system’s waterproofing approach. Where no roof penetration detail is noted, provide a flexible boot flashing and counter flashing system lapped under the roofing material.
5. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes in accordance with the roofing manufacturer’s recommendation and warranty.

D. Painting of Electrical Equipment and Hardware:

1. See Division 09 for Painting and Coatings for Electrical Systems not specifically mentioned herein.
2. Provide moisture resistant paint for exterior painting.

3. Colors shall be as shown on the Drawings, noted in the Owner's facility standards unless specified otherwise.
4. Refer to individual Sections and Construction Drawings for painting requirements of electrical equipment.
5. Exposed conduits, raceways and gutters inside and outside the building shall be painted to match the wall color.
6. All painting and materials will be completed with low VOC products. The VOC levels of all products will coincide with the LEED Gold requirements of the project or are in accordance with AHJ requirements.

E. Equipment Concrete Pads:

1. Equipment located on concrete floors either inside the building or on grade outside the building shall be mounted on a concrete base.
2. Coordinate concrete bases: Concrete bases indicated on Architectural or Structural drawings are specified in other Divisions. Concrete bases not on Architectural or Structural drawings are requirements of this Division.
3. The concrete base shall be four inches high (4") and shall extend four inches (4") beyond the edge of equipment base, unless indicated otherwise on Drawings.
4. Flush-mounted steel channels may be imbedded into the concrete pad to facilitate the anchoring of equipment.

F. Seismic Anchorage:

1. Seismic Mounting: Electrical material and equipment, including floor-mounted equipment, suspended raceways and light fixtures, shall be installed with bracing, cabling, or anchoring to comply with the latest edition of the CBC and Standard and Division 01 Section "Lateral Force Provisions." Refer to Concrete Accessories for Approved Anchors.
2. Where projects are not subject to seismic requirements, provide Code-minimum anchorage or equipment.
3. This project may be located in an area not considered to be seismically risk or may possess a seismic design factor in excess of Code-demanded minimum standards at the project's location. Resultantly, projects may have seismic requirements or design requirements in excess of local Code minimums and may still possess seismic anchorage or restraint requirements above Code-minimum requirements.

4. In all events, the seismic anchorage of electrical equipment shall be in accordance with:

   a. Division 01 Section "Lateral Force Procedures".
   b. Structural Drawings, indicating Seismic Importance Factor and other seismic resistivity requirements for the project.

5. Refer to Concrete Accessories, the Structural Drawings or the Electrical Drawings for Approved Anchors.

G. Demolition and Removal:

1. Refer to construction documents for demolition and removal details.
2. Withdraw abandoned or disconnected wiring from raceway systems, panels, enclosures pull boxes and junction boxes irrespective of whether the removal is specified in the construction documents or not. The empty raceway systems shall be tagged spare on both ends of each termination.
3. Empty conduits damaged during demolition shall be cut back and removed to the last usable section noted by the nearest coupling or conduit body.
4. Enclosures or other equipment that is existing to remain that is damaged during demolition shall be repaired or replaced to the satisfaction of the Electrical Engineer of Record (EEOR).
5. Maintain power, life-safety, lighting, and other within project area for the term of the construction, unless otherwise noted in the Project's Schedule or in the Instruction to Bidders.
6. Cutover durations shall not be exceeded without consent by the Owner and General Contractor.
7. Dispose of electrical equipment and materials pursuant to the direction of the Rosendin Project Manager.
8. Copper, aluminum, steel and all commodity recycle products shall be placed in secure bins and handled in accordance with Rosendin Security protocols without exception.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. General Requirements: Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies. Penetrations may also need to carry a fire rating or be protected from water-, thermal- or rodent-infiltration.

B. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".

C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Clean concrete walls after core drilling has been complete. Do not leave water stains on concrete walls.

1. Use metal pipe sleeves unless penetration arrangement requires rectangular sleeved opening is utilized.

2. Conduits shall not be used as the sleeve penetration for any concrete building element under any circumstances.
3. Cut sleeves to length for mounting flush with both surfaces of walls.
4. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Extend sleeves in Data Modules to 6 inches above raised floor. Encase Data Module stubs in concrete for telecommunications conduit only.
5. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
6. Seal space outside of sleeves with grout for penetrations of concrete and masonry. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

D. Exterior-Wall Penetrations:

1. Aboveground: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
2. Exterior-Wall Penetrations, Underground: Install modular sleeves “Link-Seal,” or equal. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing modular sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install seals on all exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 ARC FLASH HAZARD WARNING LABELING

A. Switchgear, switchboards, panelboards, industrial control panels, motor control centers, and meter panels/enclosures shall be labeled to warn qualified persons of potential electric shock and personal protective equipment (PPE) required.

B. Labels shall conform with all current UL or ANSI requirements for content and format.

C. Labels shall, as a minimum, display the following:

1. Incident energy in Calories/cm2 at the working distance.
2. Flash hazard boundary distance.

3. Personal protective equipment (PPE) category per NFPA 70E.
4. Shock hazard voltage when covers are removed.
5. Glove Class with leather protectors.
6. Limited approach boundary.
7. Restricted approach boundary.
8. Prohibited approach boundary.

3.7 HAZARDOUS ENERGY CONTROL

A. Each piece of equipment or machinery provided under this contract shall be capable of being locked-out/tagged-out in accordance with OSHA and Compass requirements, with instruction labels describing required procedures affixed to the respective equipment, and relevant equipment shall be analyzed and labeled in compliance with NFPA 70E.

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SECTION 26 05 11

REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section applies to all sections of Division 26.

B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.

C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company’s system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company’s system, and obtain electric utility company approval for sizes and settings of these devices.

D. Conductor ampacities specified or shown on the drawings are based on copper and aluminum (feeders with greater than 100 Amps, except for mechanical equipment), with the conduit and raceways sized per CEC.

1.2 RELATED REQUIREMENTS

A. The latest California Building Code (CBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.

B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3 TEST STANDARDS

A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise deter-

mined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3. Certified: Materials and equipment which:

   a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
   b. Are periodically inspected by a NRTL.
   c. Bear a label, tag, or other record of certification.

4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturer’s Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project,

B. Product Qualification:

1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project,

2. The HUCLA Medical Center reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.

B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.

B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:

1. Components of an assembled unit need not be products of the same manufacturer.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.
4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer and witnessed by the contractor. In addition, the following requirements shall be complied with:

1. The Owner/County shall have the option of witnessing factory tests. The Contractor shall notify the Owner/County through the HUCLA Medical Center a minimum of thirty (30) days prior to the manufacturer's performing of the factory tests.
2. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to the HUCLA Medical Center fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
3. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer and witnessed by the Contractor. The Contractor shall be liable for all additional expenses for the Government to witness factory re-testing.

1.7 VARRIATION FROM CONTRACT REQUIREMENTS

A. Where the HUCLA Medical Center or the Contractor requests variations from the contract requirements, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.8 MATERIALS AND EQUIPMENT PROTECTION

A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
3. Damaged equipment shall be repaired or replaced, as determined by the HUCLA Medical Center.
4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

A. All electrical work shall comply with requirements of the latest CEC, NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, OSHA Part 1910 subpart J – General Envi-

ronmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.

B. Job site safety and worker safety are the responsibility of the Contractor.

C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:

1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to the Facility Manager or his/her designee. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from the HUCLA Medical Center or his/her designee. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from the HUCLA Medical Center or his/her designee to witness the work.
6. All new work that may impact the existing electrical systems or installations shall be coordinated with HUCLA Medical Center.

D. Coordinate location of equipment and conduit with other trades to minimize interference.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings.

B. Working clearances shall not be less than specified in the CEC.

C. Inaccessible Equipment:

1. Where the HUCLA Medical Center determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the HUCLA Medical Center
2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

1.11 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.

B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical Systems (EES) equipment, as defined in the CEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 1/4 inch high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.

C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:

1. Nominal system voltage.
2. Equipment/bus name, date prepared, and manufacturer name and address.
3. Arc flash boundary.

4. Available arc flash incident energy and the corresponding working distance.
5. Minimum arc rating of clothing.
6. Site-specific level of PPE.

1.12 SUBMITTALS

A. Submit to the HUCLA Medical Center in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. The Government's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.

C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Government to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.

D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.

E. The submittals shall include the following:

1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.

4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.

F. Maintenance and Operation Manuals:

1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.

4. The manuals shall include:

a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
b. A control sequence describing start-up, operation, and shutdown.
c. Description of the function of each principal item of equipment.
d. Installation instructions.
e. Safety precautions for operation and maintenance.
f. Diagrams and illustrations.
g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
h. Performance data.
i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.

H. After approval and prior to installation, furnish the HUCLA Medical Center with one sample of each of the following:

1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was

taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.

2. Each type of conduit coupling, bushing, and termination fitting.
3. Conduit hangers, clamps, and supports.
4. Duct sealing compound.
5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

1.13 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.14 ACCEPTANCE CHECKS AND TESTS

A. The Contractor shall furnish the instruments, materials, and labor for tests.

B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer’s representatives and technicians so that a complete, functional, and operational system is delivered to the HUCLA Medical Center.

C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the HUCLA Medical Center.

1.15 WARRANTY

A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the HUCLA Medical Center.

1.16 INSTRUCTION

A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.

B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.

C. A training schedule shall be developed and submitted by the Contractor and approved by the Owner/County Representative at least 14 days prior to the planned training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 26 05 13

MEDIUM VOLTAGE CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of medium-voltage cables, indicated as cable or cables in this section, and medium-voltage cable splices and terminations.

1.2 RELATED WORK

A. Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

B. Section 26 0533, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for medium-voltage cables.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 0511, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

A. Factory Tests shall be required.

B. Factory Tests shall be in accordance with Paragraph, MANUFACTURED PRODUCTS in Section 26 0511, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirement:

1. A representative sample of Medium-voltage cables from each lot shall be factory tested per NEMA WC 74 to ensure that there are no electrical defects in that specific lot of cable.

1.5 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:

1. Shop Drawings:

   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Submit the following data for approval:

      1) Complete electrical ratings.
      2) Installation instructions.

2. Samples:

   a. After approval of submittal and prior to installation, Contractor shall furnish sample in accordance with Section 26 0511, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

3. Certifications:

   a. Factory Test Reports: Submit certified factory production test reports for approval.
   b. Field Test Reports: Submit field test reports for approval.
   c. Compatibility: Submit a certificate from the cable manufacturer that the splices and terminations are approved for use with the cable.
   d. Two weeks prior to final inspection, submit the following.

      1) Certification by the manufacturer that the cables, splices, and terminations conform to the requirements of the drawings and specifications.
      2) Certification by the Contractor that the cables, splices, and terminations have been properly installed and tested.
      3) Certification by the Contractor that each splice and each termination were completely installed in a single continuous work period by a single qualified worker without any overnight interruption.

4. Qualified Worker Approval:

   a. Qualified workers who install cables, splices, and terminations shall have experience splicing and terminating cables, including experience with the materials in the approved splices and terminations. Qualified workers who perform cable testing shall have a minimum of five year of experience performing

electrical testing of medium-voltage cables, including the ability to understand, interpret test results and develop test report.

b. Furnish satisfactory proof of such experience for each qualified worker who splices or terminates the cables.

5. Electric Utility Company Approval:

a. Prior to construction, obtain written approval from the electric utility company for the following items:

1) Service entrance cables, splices, and terminations.
2) A list of qualified workers who will install, splice, and terminate the service entrance cables.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Society for Testing and Materials (ASTM):

B3-13 Standard Specification for Soft or Annealed Copper Wire

C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

48-09 Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV

386-06 Separable Insulated Connector Systems for Power Distribution Systems above 600 V

400-12 Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems

400.2-13 Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)

404-12 Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500,000 V

D. National Electrical Manufacturers Association (NEMA):

WC 71-14 Non-Shielded Cables Rated 2001-5000 Volts for Use in the Distribution of Electric Energy

WC 74-12 5-46 KV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy

E. National Fire Protection Association (NFPA):

70-17 National Electrical Code (NEC)

F. Underwriters Laboratories (UL):

1072-06 Medium-Voltage Power Cables

1.7 SHIPMENT AND STORAGE

A. Cable shall be shipped on reels such that it is protected against physical, mechanical and environmental damage. Each end of each length of cable shall be hermetically sealed with manufacturer's end caps and securely attached to the reel.

B. Cable stored and/or cut on site shall have the ends turned down, and sealed with cable manufacturer's standard cable end seals, or field-installed heat-shrink cable end seals.

PART 2 - PRODUCTS

2.1 CABLE

A. Approved Manufacturers:

1. Southwire.
2. General Cable/Prysmian.
3. Okonite.
4. Kerite Co.

B. Cable shall be in accordance with ASTM, IEEE, CEC, NEMA and UL, and as shown on the drawings.

C. Single conductor stranded copper conforming to ASTM B3.

D. Voltage Rating:

1. 5,000 V cable shall be used on 4,160 V distribution systems.

2. 15,000 V cable shall be used on all distribution systems with voltages ranging from 5,000 V to 15,000 V.

E. Insulation:

1. Insulation level shall be 133%.

2. Types of insulation:

a. Cable type abbreviation, EPR: Ethylene propylene rubber insulation shall be thermosetting, light and heat stabilized.

F. Insulation shield shall be semi-conducting. Conductor shield shall be semi-conducting.

G. Insulation shall be wrapped with copper shielding tape, helically-applied over semi-conducting insulation shield.

H. Heavy duty, overall protective polyvinyl chloride jacket shall enclose every cable. The manufacturer's name, cable type and size, and other pertinent information shall be marked or molded clearly on the overall protective jacket.

I. Cable temperature ratings for continuous operation, emergency overload operation, and short circuit operation shall be not less than the CEC, NEMA WC 71, or NEMA WC 74 standard for the respective cable.

2.2 SPLICES AND TERMINATIONS

A. Materials shall be compatible with the cables being spliced and terminated, and shall be suitable for the prevailing environmental conditions.

B. In locations where moisture might be present, the splices shall be watertight. In manholes and pull boxes, the splices shall be submersible.

C. Splices:

1. Shall comply with IEEE 404. Include all components required for complete splice, with detailed instructions.

D. Terminations:

1. Shall comply with IEEE 48. Include shield ground strap for shielded cable terminations.
2. Class 1 terminations for indoor use: Kit with stress-relief tube, molded-silicone rubber insulator modules, and compression-type connector.

3. Class 1 terminations for indoor use: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.
4. Class 3 terminations for outdoor use: Kit with stress cone and compression-type connector.
5. Load-break terminations for indoor and outdoor use: 200 A loadbreak premolded rubber elbow connectors with bushing inserts, suitable for submersible applications. Separable connectors shall comply with the requirements of IEEE 386, and shall be interchangeable between suppliers. Allow sufficient slack in medium-voltage cable, ground, and drain wires to permit elbow connectors to be moved to their respective parking stands.
6. Dead-break terminations for indoor and outdoor use: 600 A deadbreak premolded rubber elbow connectors with bushing inserts, suitable for submersible applications. Separable connectors shall comply with the requirements of IEEE 386, and shall be interchangeable between suppliers. Allow sufficient slack in medium-voltage cable, ground, and drain wires to permit elbow connectors to be moved to their respective parking stands.
7. Ground metallic cable shields with a device designed for that purpose, consisting of a solderless connector enclosed in watertight rubber housing covering the entire assembly.
8. Provide insulated cable supports to relieve any strain imposed by cable weight or movement. Ground cable supports to the grounding system.

2.3 FIREPROOFING TAPE

A. Fireproofing tape shall be flexible, non-corrosive, self-extinguishing, arcproof, and fireproof intumescent elastomer. Securing tape shall be glass cloth electrical tape not less than 0.18 mm (7 mils) thick, and 19 mm (0.75 inch) wide.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the CEC, as shown on the drawings, and manufacturer’s instructions.

B. Cable shall be installed in conduit above grade and duct bank below grade.

C. All cables of a feeder shall be pulled simultaneously.

D. Conductors of different systems (e.g., 5kV and 15kV) shall not be installed in the same raceway.

E. Splice the cables only in manholes and pullboxes.

F. Ground shields in accordance with Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

G. Cable maximum pull length, maximum pulling tension, and minimum bend radius shall conform with the recommendations of the manufacturer.

H. Use suitable lubricating compounds on the cables to prevent pulling damage. Provide compounds that are not injurious to the cable jacket and do not harden or become adhesive.

I. Seal the cable ends prior to pulling, to prevent the entry of moisture or lubricant.

3.2 PROTECTION DURING SPLICING OPERATIONS

A. Blowers shall be provided to force fresh air into manholes where free movement or circulation of air is obstructed. Waterproof protective coverings shall be available on the work site to provide protection against moisture while a splice is being made. Pumps shall be used to keep manholes dry during splicing operations. Under no conditions shall a splice or termination be made that exposes the interior of a cable to moisture. A manhole ring at least 150 mm (6 inches) above ground shall be used around the manhole entrance to keep surface water from entering the manhole. Unused ducts shall be plugged and water seepage through ducts in use shall be stopped before splicing.

3.3 PULLING CABLES IN DUCTS AND MANHOLES

A. Cables shall be pulled into ducts with equipment designed for this purpose, including power-driven winches, cable-feeding flexible tube guides, cable grips, pulling eyes, and lubricants. A sufficient number of qualified workers and equipment shall be employed to ensure the careful and proper installation of the cable.

B. Cable reels shall be set up at the side of the manhole opening and above the duct or hatch level, allowing cables to enter through the opening without reverse bending. Flexible tube guides shall be installed through the opening in a manner that will prevent cables from rubbing on the edges of any structural member.

C. Cable shall be unreeled from the top of the reel. Pay-out shall be carefully controlled. Cables to be pulled shall be attached through a swivel to the main pulling wire by means of a suitable cable grip and pulling eye.

D. Woven-wire cable grips shall be used to grip the cable end when pulling small cables and short straight lengths of heavier cables.

E. Pulling eyes shall be attached to the cable conductors to prevent damage to the cable structure.

F. Cables shall be liberally coated with a suitable lubricant as they enter the tube guide or duct. Rollers, sheaves, or tube guides around which the cable is pulled shall conform to the minimum bending radius of the cable.

G. Cables shall be pulled into ducts at a reasonable speed. Cable pulling using a vehicle shall not be permitted. Pulling operations shall be stopped immediately at any indication of binding or obstruction, and shall not be resumed until the potential for damage to the cable is corrected. Sufficient slack shall be provided for free movement of cable due to expansion or contraction.

H. Splices in manholes shall be firmly supported on cable racks. Cable ends shall overlap at the ends of a section to provide sufficient undamaged cable for splicing.

I. Cables cut in the field shall have the cut ends immediately sealed to prevent entrance of moisture.

3.4 SPLICES AND TERMINATIONS

A. Install the materials as recommended by the manufacturer, including precautions pertaining to air temperature and humidity during installation.

B. Installation shall be executed by qualified person trained to perform medium-voltage equipment installations. Tools shall be as recommended or provided by the manufacturer. Installation shall comply with manufacturer's instructions.

C. Splices in manholes shall be located midway between cable racks on walls of manholes, and supported with cable arms at approximately the same elevation as the enclosing duct.

D. Where the HUCLA Medical Center determines that unsatisfactory splices and terminations have been installed, the Contractor shall replace the unsatisfactory splices and terminations with approved material at no additional cost to the HUCLA Medical Center.

3.5 FIREPROOFING

A. Cover all cable segments exposed in manholes and pullboxes with fireproofing tape.

B. Apply the tape in a single layer, wrapped in a half-lap manner, or as recommended by the manufacturer. Extend the tape not less than 25 mm (1 inch) into each duct.

C. At each end of a taped cable section, secure the fireproof tape in place with glass cloth tape.

3.6 CIRCUIT IDENTIFICATION OF FEEDERS

A. In each manhole and pullbox, install permanent identification tags on each circuit's cables to clearly designate the circuit identification and voltage. The tags shall be the embossed brass type, 40 mm (1.5 inches) in diameter and 40 mils thick. Attach tags with plastic ties. Position the tags so they will be easy to read after the fireproofing tape is installed.

3.7 ACCEPTANCE CHECKS AND TESTS

A. General:

1. Perform tests in accordance with the latest IEEE 400 and 400.2, manufacturer's recommendations, and as specified in this specification.
2. Contractor shall make arrangements to have tests witnessed by the Facility representative. Contractors shall proceed with tests only after obtaining approval from the Facility Manager.

B. Visual Inspection: Perform visual inspection prior to electrical tests.

1. Inspect exposed sections of cables for physical damage.
2. Inspect shield grounding, cable supports, splices, and terminations.
3. Verify that visible cable bends meet manufacturer’s minimum bending radius requirement.
4. Verify installation of fireproofing tape and identification tags.
5. At the time of final acceptance, Contractor shall provide the Facility representative visual field inspection notes, findings, and photographs detailing accessible inspection locations.

C. Electrical Tests - New Cables: Perform preparation and tests in order shown below:

1. Preparation Prior to Testing: Splices and terminations applied to new cables shall be completed prior to testing. For renovation installation, ends of new cables intended to be spliced to existing service-aged cables shall be prepared (cut back) to allow testing without flashover or tracking. Cables shall not be connected to other equipment while under test.

2. Perform Insulation-Resistance Test. Test all cables with respect to ground and adjacent cables. All adjacent cables shall be grounded during testing.

   a. Apply test voltage for a period sufficient to stabilize output voltage and insulation resistance measurement.
   b. Test data shall include megohm, applied test voltage, and leakage current readings.
   c. Further testing shall not continue unless the insulation resistance test results meet or exceed the values listed below. Test voltages and minimum acceptable resistance values shall be:

Voltage Class	Test Voltage	Min. Insulation Resistance
5kV	2,500 VDC	1,000 megohms
15kV	2,500 VDC	5,000 megohms

3. Perform Tan Delta test. Review test readings with HUCLA Medical Center prior to proceeding with the Very Low Frequency (VLF) Withstand test

4. Perform Very Low Frequency (VLF) Withstand test. Utilize test voltages in accordance with IEEE 400.2.

D. Electrical Tests – Inter-connected New Cables and Service-Aged Cables: After successful Tan Delta and VLF Withstand testing of new cables and service-aged cables, perform final splicing inter-connecting between new and service-aged cables. Once new and service-aged cables are completely inter-connected, conduct Tan Delta and VLF Withstand tests for the entire inter-connected cable. Utilize maintenance test voltage for VLF Withstand testing.

E. Field Test Report: Submit a field test report to HUCLA Medical Center and EEOR that includes the following information:

1. Project Name, Location, Test Date.
2. Name of Technician and Company performing the test.
3. Ambient temperature and humidity at time of test.
4. Name, Model Number and Description of Test Equipment used.
5. Circuit identification, cable length, cable type and size, insulation type, cable manufacturer, service age (if any), voltage rating, description of splices or terminations.
6. Visual field inspection notes, findings, and photographs.

7. Insulation Resistance Test results:

    a. Test voltage.
    b. Measurement in Megohms.
    c. Leakage current.

8. Tan Delta results:

    a. Test voltage.
    b. Waveform (sinusoidal or cosine-rectangular).
    c. Mean Tan Delta at V_0.
    d. Stability measured by Standard Deviation at V_0.
    e. Differential Tan Delta.
    f. IEEE Condition Assessment Rating.

9. VLF Withstand results:

    a. Test voltage.
    b. Waveform (sinusoidal or cosine-rectangular).
    c. Pass/Fail Rating.

10. Conclusions. If any deficiency is discovered based on test results, provide recommendations for corrective action.

F. Final Acceptance: Final acceptance shall depend upon the satisfactory performance of the cables under test. No cable shall be put into service until all tests are successfully passed, and field test reports have been approved by the Owner.

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Documents:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

C. Related Sections:

1. Section 07 8413 – Penetration Firestopping
2. Section 26 0500 – Common Work Results for Electrical
3. Section 26 0529 – Hangers and Supports for Electrical Systems
4. Section 26 0553 – Identification for the Electrical Systems

1.2 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

a. Copper Wire.
b. Aluminum Wire.
c. M/C Cable.
d. Wire Connectors.

1.3 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Wires and Cables:

   a. AFC Cable Systems.
   b. Cerro Wire & Cable.
   c. Encore Wire.
   d. Southwire.
   e. Superior Essex.
   f. Or approved equal.

2. Connectors for Wires and Cables:

   a. Arlington Industries.
   b. Ideal Industries.
   c. 3M.
   d. Ilsco.
   e. Thomas & Betts.
   f. Or approved equal.

2.2 CONDUCTORS AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Conductor Insulation Material: Type THW, THHN-THWN, XHHW, UF, USE, and SO complying with NEMA WC 70.

C. Thermoplastic Insulation Material: Comply with NEMA WC 70.

D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 70.

E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 70.

F. Conductor Material: Copper complying with ICEA S-95-658 / NEMA WC 70 Non-shielded 0-2 kV Cables. Aluminum conductors, when used for feeders 100A or greater, are also acceptable.

G. Stranding: Stranded conductor for No. 12 AWG and larger; solid conductor for smaller than No. 12 AWG.

H. Multiconductor Cable: Metal-clad cable, Type MC, THHN copper conductors with integral green ground wire, lightweight steel clad, UL Standard 1569, Type SO and Type USE with ground wire.

2.3 CONNECTORS AND SPLICES

A. Approved Manufacturers:

1. FC Cable Systems.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.
6. Or approved equal.

B. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW, XHHW or THWN, in raceway.

B. Horizontal Feeders: Type THHN/THWN or XHHW, in raceway or multiconductor cable type.

C. Vertical Feeders: Type THHN/THWN or XHHW, in raceway or multiconductor cable type.

D. Fire-Pump Feeder: Type RHH-2, XHHW or approved equal method.

E. Horizontal Branch Circuits: Type THHN/THWN, in raceway or multiconductor cable type.

F. Vertical Branch Circuits: Type THNN/THWN in raceway or multiconductor cable type.

G. Fire alarm Circuits: Power-limited, fire-protective, signaling circuit cable, Type THHN/THWN, in raceway or multiconductor cable type.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips, which will not damage cables or raceway.

E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 – Hangers and Supports for Electrical Systems.

G. Seal around cables penetrating fire-rated elements according to Section 07 8413 – Penetration Firestopping.

H. Identify wires and cables according to Section 26 0553 – Identification for the Electrical Systems.

3.4 CONNECTIONS

A. Conductor Splices: Keep to a minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Perform visual and mechanical inspection as stated in NETA ATS, Section 7.3.2.1.
2. Perform continuity tests to insure correct cable connection.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

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SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding of Electrical Systems and Equipment

a. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections:

1. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.

1.2 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

a. Ground rods.
b. Ground lugs.
c. Bare Copper Cable.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Grounding Conductors, Cables, Connectors, and Rods:

   a. Erico.
   b. Copperweld.
   c. Thomas & Betts.
   d. Or approved equal.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 0519 - "Low-Voltage Electrical Power Conductors and Cables".

B. Material: Aluminum, copper-clad aluminum, and copper. Use copper for grounding distribution system.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

   1. Solid Conductors: ASTM B3.
   2. Assembly of Stranded Conductors: ASTM B8.
   3. Tinned Conductors: ASTM B33.

H. Copper Bonding Conductors: As follows:

   1. Bonding Conductor: sized per code.
   2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   3. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

J. Equipment Ground Conductor (Green) shall be included with all circuit conductors. In addition, provide a neutral conductor where applicable.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: copper-clad steel

1. Size: 120 inches long by 3/4 inches in diameter.
2. Other electrodes as required per NFPA 70.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Metal-clad cable runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

G. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

I. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

J. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a standard size grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Ground Rods: Install a ground rod or ground rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes to achieve the specified value for that location.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to CEC (NFPA) 70, Paragraph 250-81(c), using a minimum of 40 feet of bare copper conductor not smaller than No. 4/0 AWG. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

G. If required, install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

   a. Equipment Rated 500 kVA and less: 25 ohms
   b. Equipment Rated 500 to 1000 kVA: 5 ohms
   c. Equipment Rated More Than 1000 kVA: 3 ohms
   d. Substations and Pad-Mounted Switching Equipment: 5 ohms. Manhole Grounds: 25 ohms

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner representative promptly and include recommendations to reduce ground resistance.

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Seismic restraints for electrical equipment and systems.

1.2 REFERENCES

A. National Fire Protection Association:

1. NFPA 70 – National Electrical Code.

B. Underwriters Laboratories Inc:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Product Data:

1. Hangers and Supports: Submit manufacturers catalog data.
2. Firestopping: Submit manufacturers product data.

B. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.
2. Firestopping: Submit preparation and installation instructions.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Fire Resistant Joints between Floor Slabs and Exterior Walls: ASTM E119 fire resistant rating as indicated on Drawings for floor assembly.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Perform Work in accordance per local Municipality standard.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.9 PROJECT CONDITIONS

A. Project Seismic Design Category: D.

B. Project Seismic Risk Category: IV.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five times the applied force.

B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly.

1. Manufacturers:

a) Cooper B-Line; a division of Cooper Industries.
b) ERICO International Corporation.
c) Allied Support Systems; Power-Strut Unit.
d) Thomas & Betts Corporation.
e) Unistrut; Tyco International, Ltd.
f) Or equal.

2. Finishes:

a) Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3.
b) Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-3.
c) Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-3.

3. Channel Dimensions: Selected for structural loading and applicable seismic forces.

C. Raceway and Cable Supports: As described in NECA 1.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a) Manufacturers:

      1) Hilti, Inc.
      2) ITW Construction Products.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co. Inc.
      5) Or equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a) Manufacturers:
      1) Cooper B-Line; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc
      3) Hilti, Inc.ITW Construction Products.
      4) MKT Fastening, LLC.
      5) Powers Fasteners.
      6) Or equal.

3. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 SEISMIC-RESTRAINT COMPONENTS

A. Rated Strength, Features, and Application Requirements for Restraint Components: As defined in reports by an agency acceptable to the University.

1. Structural Safety Factor: Strength in tension, shear, and pullout force of components used shall be at least five times the maximum seismic forces to which they will be subjected.

B. Angle and Channel-Type Brace Assemblies: Steel angles or steel slotted-support-system components; with accessories for attachment to braced component at one end and to building structure at the other end.

C. Cable Restraints: ASTM A 603, zinc-coated, steel wire rope attached to steel or stainless-steel thimbles, brackets, swivels, and bolts designed for restraining cable service.

1. Manufacturers:

a) Amber/Booth Company, Inc.
b) Loos & Co., Inc.
c) Mason Industries, Inc.
d) Or equal.

2. Seismic Mountings, Anchors, and Attachments: Devices as specified in Part 2 "Support, Anchorage, and Attachment Components" Article, selected to resist seismic forces.
3. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod, of design recognized byan agency acceptable to the University. Retain both subparagraphs below for projects subject to seismic design requirements; delete if bushing requirements are included in details or charts on Drawings.
4. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to type and size of anchor bolts and studs used.
5. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to type and size of attachment devices used.

2.3 SLEEVES

A. Furnish materials in accordance per local Municipality standards.

B. Sleeves required for Through Non-fire Rated Floors.

C. Sleeves required for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors.

D. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

E. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.4 MECHANICAL SLEEVE SEALS

A. Furnish materials in accordance with authority having jurisdiction requirements.

B. B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.5 FIRESTOPPING

A. Furnish materials in accordance with authority having jurisdiction requirements.

2.6 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

C. General:

1. Furnish UL listed products or products tested by independent testing laboratory.
2. Select products with rating not less than rating of wall or floor being penetrated.

D. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.

2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

B. Verify openings are ready to receive firestopping.

3.2 APPLICATION

A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as scheduled in NECA 1, where Table 1 lists maximum spacing less than stated in. Minimum rod size shall be 1/4 inch in diameter.

C. For individual conduit runs not directly fastened to the structure, use rod hangers.

D. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split galvanized hangers.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system. Supports should be spaced for maximum deflection of conduit not greater than 1/8”.

3.3 SUPPORT AND SEISMIC-RESTRAINT INSTALLATION

A. Comply with NECA 1 for installation requirements, except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, RMC may be supported by openings through structure members, as permitted in CEC (NFPA 70).

C. Install seismic-restraint components using methods approved by the evaluation service providing required submittals for component.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.4 INSTALLATION OF SEISMIC-RESTRAINT COMPONENTS

A. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolts and mounting hole in concrete base.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Restraint Cables: Provide slack within maximums recommended by manufacturer.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

E. Provide raceway fixtures and equipment systems with appropriate longitudinal and cross bracing to satisfy Seismic Zone 4 requirements.

3.5 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Utilize appropriate anchors and fasteners.
2. Solid Masonry Walls: Provide expansion anchors and/or preset inserts.
3. Sheet Metal: Provide sheet metal screws.
4. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

C. Install conduit and raceway support and spacing in accordance with CEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Install Work in accordance with local Municipality requirements.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.7 INSTALLATION – FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

3.8 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

3.9 INSTALLATION – SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

3.10 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

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SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Raceways include the following:

   a. EMT – Electrical Metallic Tubing.
   b. PVC – Polyvinyl Chloride Conduit.
   c. FMC – Flexible Metal Conduit.
   d. LFMC – Liquidtight Flexible Metallic Conduit.
   e. LFNC – Liquidtight Flexible Nonmetallic Conduit.
   f. RMC – Rigid Metal Conduit.
   g. RNC – Rigid Nonmetallic Conduit.
   h. IMC – Intermediate Metal Conduit.
   i. Wireways.

2. Boxes, enclosures, and cabinets include the following:

   a. Device boxes.
   b. Floor boxes.
   c. Outlet boxes.
   d. Pull and junction boxes.
   e. Cabinets and enclosures.

B. Related Sections:

1. Section 01 8113 – Sustainable Design Requirements.
2. Section 07 8413 – Penetration Firestopping.
3. Section 26 0500 – Common Work Results for Electrical: For raceways and box supports.
4. Section 26 2726 – Wiring Devices: For devices installed in boxes and for floor-box service fittings.

1.2 SUBMITTALS

A. Submit in accordance with Section 26 05 00 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For surface raceways, wireways, fittings, floor boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electric Code".

B. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, "National Electric Code" Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
3. Comply with NECA 111 “Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)”.

1.4 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Metal Conduit and Tubing:

   a. MetalAllied.
   b. Republic Conduit.
   c. Western Tube & Conduit.
   d. Wheatland.
   e. Or approved equal.

2. Flexible Conduit:

   a. AFC.
   b. Anaconda.
   c. Eastern Wire.
   d. Southwire.
   e. Or approved equal.

3. Nonmetallic Conduit and Tubing:

a. Allied.
b. Carlon.
c. Or approved equal.

4. Conduit Bodies and Fittings:
   a. Allied.
   b. Appleton.
   c. Arlington.
   d. Thomas & Betts.
   e. Or approved equal.

5. Metal Wireways:
   a. B-Line.
   b. Hoffmann.
   c. Wiegmann.
   d. Or approved equal.

6. Surface Raceways:
   a. Mono-Systems Inc.
   b. Wiremold Company (The).
   c. Hubbell, Inc.
   d. Panduit Corp.
   e. Or approved equal..

7. Boxes, Enclosures, and Cabinets:
   a. B-Line.
   b. Hoffmann.
   c. Wiegmann.
   d. Or approved equal.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit and IMC: ANSI C80.1.

B. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

C. EMT and Fittings: ANSI C80.3.

D. Fittings: Set-screw or compression type.

E. FMC: Zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated, NEMA 1 or 3R as applicable.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Description: PVC plastic extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections using plastic fasteners.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

2.8 FLOOR BOXES

A. Floor Boxes: Cast metal or PVC, fully adjustable, rectangular.

2.9 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.10 ENCLOSURES AND CABINETS

A. Enclosures: NEMA 250, Type 1 or Type 3R as indicated on drawings.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for free-standing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 METHODS

A. Outdoors:

1. Exposed: RMC, EMT or IMC.
2. Concealed: RMC, IMC, EMT, FMC or HFC cable (indoor and outdoor areas).
3. Underground, Single Run: PVC.
4. Underground, Grouped: PVC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.
2. Exposed on ceilings and wall in Mechanical Equipment Rooms: RMC and IMC where subjected to damage, and when mounted below 8-inches from Above Finished Floor (AFF).
3. Exposed in Electrical Rooms: EMT, flexible conduit and concealed in cable tray and/or not subject to damage.
4. Concealed in spaces above hung ceiling and wall: EMT, FMC, HFC cable.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
6. Damp or Wet Locations: RMC or EMT with Raintight fittings.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   Damp or Wet Locations: NEMA 250, Type 3R.

C. Underground or concrete encased:

Schedule 40 PVC.

D. Minimum Raceway Size: 3/4-inch trade size.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.3 INSTALLATION – GENERAL

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Set floor boxes level and adjust to finished floor surface.

C. Install enclosures and cabinets plumb. Support at each corner.

D. Size all conduits supplying motors and associated control equipment to include equipment grounding conductor sized per NFPA 70 whether or not shown on the drawings or specified.

E. Unless otherwise noted, terminate all conduits stubbing up inside rooms or roof as follows:

1. Conduits for AC power: Stub up 6 inches above finished floor and provide concrete sill to protect stub-ups.

2. On PVC conduit for AC power and control cable, provide PVC to galvanized steel rigid conduit adaptor.
3. Plug or cap all conduits during construction or until permanent conductors are installed. Taped ends will not be allowed.

F. Where embedded conduit crosses a structural expansion joint, expansion and deflection fitting shall be installed.

G. Tighten set screws of threadless fittings with suitable tools.

3.4 INSTALLATION – RACEWAYS

A. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Install raceways level and square and at proper elevations. Provide adequate headroom.

D. Support raceways as specified in Section 26 05 00 - "Basic Electrical Materials and Methods".

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

G. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

H. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

I. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Transition from Schedule 40 nonmetallic conduit to rigid steel conduit, before rising above floor.

J. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

K. Join raceways with fittings designed and approved for the purpose and make joints tight.

L. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

M. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

N. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

O. Telephone and Signal System Raceways, 2 Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

P. FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use Liquidtight flexible conduit in wet or damp locations. Install ground conductor across flexible connections.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.6 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

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SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 26 0500 "Common Work Results for Electrical".

C. Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables".

D. Section 26 0526 “Grounding and Bonding for Electrical Systems".

E. Section 26 0553 "Identification for Electrical Systems".

1.3 DEFINITION

A. EMT – Electrical Metallic Tubing.

B. PVC – Polyvinyl Chloride Conduit.

C. FMC – Flexible Metal Conduit.

D. LFMC – Liquidtight Flexible Metallic Conduit.

E. LFNC – Liquidtight Flexible Nonmetallic Conduit.

F. RMC – Rigid Metal Conduit.

G. RNC – Rigid Nonmetallic Conduit.

H. IMC – Intermediate Metal Conduit.

1.4 SUBMITTALS

A. Submit in accordance with Section 26 05 00 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

   a. Duct-bank materials, including separators and miscellaneous components.
   b. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
   c. Accessories for manholes, handholes, boxes, and other utility structures.
   d. Warning tape.
   e. Warning planks.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Ladder details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

C. Shop Drawings for Factory-Fabricated Handholes and Pull Boxes other than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

D. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

E. Product Certificates: For concrete and steel used in precast concrete manholes, pull boxes and handholes, as required by ASTM C 858.

F. Source quality-control reports.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and pull boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

PART 2 - PRODUCTS

2.1 CONDUIT

A. RNC: NEMA TC 2, Type EPC40PVC and Type EPC80PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.
12. Or approved equal.

B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB20PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems".
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000 psi concrete.

    a. Mark each plank with "ELECTRIC" in 2 inch high, 3/8 inch deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND PULL BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group.
5. Riverton Concrete Products; a division of Cretex Companies, Inc.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile, Inc.
9. Jensen.
10. Or approved equal.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A153 and ASTM A123.

D. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or pull box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC." "TELEPHONE." "DATA". "SIGNAL". As indicated for each service.
4. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.

5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of 12 inches.
    b. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.

6. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.

7. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.

2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering

    a. "ELECTRIC." "TELEPHONE." "DATA". "SIGNAL". As indicated for each service. Insert legend.

6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Hand-holes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Pull Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two. Handholes and pull boxes shall comply with the requirements of SCTE 7 Tier 5 loading.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. CDR Systems Corporation.
    d. NewBasis.
    e. Or approved equal.

C. Fiberglass Handholes and Pull Boxes with Polymer Concrete Frame and Cover: Complying with SCTE 77 Tier 5 loading. Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. Christy Concrete Products.
    d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.
    e. Or approved equal.

D. Fiberglass Handholes and Pull Boxes: Molded of fiberglass-reinforced polyester resin, with covers of cast iron, complying with SCTE 77 Tier 5 loading.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carson Industries LLC.
    b. Christy Concrete Products.
    c. Nordic Fiberglass, Inc.
    d. Or approved equal.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and pull boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer as determined by the Owner. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 CORROSION PROTECTION

A. Aluminum shall not be installed in contact with earth or concrete.

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables Over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

D. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Pull Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:

1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Non-deliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
2. Units in Sidewalk and Similar Applications with a Safety Factor for Non-deliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
3. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester-resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Division 31 Section "Earth Moving" but do not use heavy-duty, hydraulic-operated, compaction equipment.

3.5 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured bends with a radius of 36 inches, both horizontally and vertically. If smaller radius bends are required, provide pull calculations to verify there will be no additional strain or damage to the installed cable.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Division 26 Section "Common Work Results for Electrical".

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.

G. Pulling Cord: Install 100 lbf-test nylon cord in ducts, including spares.

H. Concrete-Encased, Nonmetallic Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
5. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 3 inches between ducts for like services, and 4 inches between power and signal ducts.
6. Depth: Install top of duct bank at least 24 inches below finished grade in no traffic areas and at least 30 inches below finished grade in vehicular traffic areas, unless otherwise indicated.

I. Direct-Buried Ducts: Support ducts on duct spacers.

1. Separator Installation: Space separators not more than 4 feet center-to-center along entire length of duct bank including top pipes.
2. Install expansion fittings as shown on Shop Drawings.
3. Backfill: Install backfill as specified in Division 31 Section "Earth Moving." After installing first tier of ducts, backfill and compact. Repeat backfilling after placing each tier. Firmly tamp backfill around ducts to provide maximum supporting strength. After placing controlled backfill over final tier, complete backfilling normally. Do not place backfill for a period of at least 24 hours after pouring of concrete.
4. Minimum Clearances between Ducts: 3 inches between ducts for like services and 6 inches between power and signal ducts.

3.6 INSTALLATION OF HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level 6-inch thick bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and traffic-ways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

F. For enclosures installed in asphalt paving and subject to occasional, non-deliberate, heavy vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi, 28- day strength, complying with Division 03 Section "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

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SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

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SECTION 26 05 48

VIBRATION AND SEISMIC CONTROL FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It complements optional seismic construction requirements in the various electrical component Sections.

1.2 DEFINITIONS

A. CBC: California Building Code.

B. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

C. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independent of other mobile structural elements during an earthquake.

1.3 SUBMITTALS

A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.

1. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by ICBO Evaluation Service.

B. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.

1. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacing, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.

C. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for electrical components with other systems and equipment, including other seismic restraints, in the vicinity.

D. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

1.4 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in California Building Code/Code of Regulations, unless requirements in this Section are more stringent.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in California and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.

C. Testing Agency Qualifications: An independent testing agency, acceptable to Owner’s Representative, with the experience and capability to conduct the testing indicated.

1.5 PROJECT CONDITIONS

A. Project Seismic Design Category: D.

B. Project Seismic Rick Category: IV.

C. Acceleration Factor: 8 Km from seismic source B.

D. Soil profile type Sc.

E. For additional criteria, see Structural Drawings.

1.6 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-Line Systems, Inc.
2. Erico, Inc.
3. Powerstrut.
4. Thomas & Betts Corp.
5. Unistrut Corporation.
6. PHD.
7. Or equal.

B. Or Equal: Where products are specified by manufacturers name and accompanied by the term "or equal", comply with provisions in Division 01 Section “Product Requirements”, Part 2 “Product Substitutions” Article. Specific procedures must be followed before use of an unnamed product or manufacturer.

2.2 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Owner’s Representative.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch- thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 570, GR 33.
2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install seismic restraints according to applicable codes and regulations and as approved by the Owner's Representative unless more stringent requirements are indicated.

3.2 STRUCTURAL ATTACHMENTS

A. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses in accordance with the structural engineer of record approval.

B. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.

C. Attachments to Existing Concrete: Use expansion anchors.

D. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.

E. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.

F. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.

G. Attachments to Wood Structural Members: Install bolts through members.

H. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

3.3 ELECTRICAL EQUIPMENT ANCHORAGE

A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

B. Anchor panel boards, motor-control centers, motor controls, switchboards, switchgear, transformers, unit substations, fused power-circuit devices, transfer switches, busways, battery racks, static uninterruptible power units, power conditioners, capacitor units, communication system components, and electronic signal processing, control, and distribution units as follows:

1. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.
2. Concrete Bases for Floor-Mounted Equipment: Use female expansion anchors and install studs and nuts after equipment is positioned.
3. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.
4. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
5. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

3.4 SEISMIC BRACING INSTALLATION

A. Install bracing according to spacing and strengths indicated by approved analysis.

B. Expansion and Contraction: Install to allow for thermal movement of braced components.

C. Cable Braces: Install with maximum cable slack recommended by manufacturer.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in raceways, cables, wire ways, cable trays, and busways where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where

they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

B. Related Sections:

1. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.
2. Section 26 0533 – Raceways and Boxes for Electrical Systems.
3. Section 26 2400 – Switchboards.
4. Section 26 2416 – Panelboards.
5. Section 26 2726 – Wiring Devices.
6. Section 26 2816 – Enclosed Switches and Circuit Breakers.

1.2 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

a. For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70 "National Electric Code".

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Brady USA.
2. Panduit.

3. Or approved equal.

2.2 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage.

B. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

C. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

D. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line

E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Aluminum, Wraparound Marker Bands: Bands cut from 0.014 inch thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

G. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

H. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

2.3 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 3/32 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4 inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4 inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: According to color-coding.

PART 2 - PART 3 -EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Color Banding for exposed Raceways and exposed Cables excluding electrical rooms: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pre-tensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50 foot maximum intervals in straight runs, and at 25 foot maximum intervals in 3.

3. Apply the following colors to the systems listed below:

   a. Fire Alarm System: Red.
   b. Security System: Blue and yellow.
   c. Telecommunication System: Green and yellow.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.
Exposed Boxes: Self-adhesive plastic label on cover.
Concealed Boxes: Permanent marker on outside of cover.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

1. Color-code 208/120-V system as follows:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.
   e. Ground: Green.

2. Color-code 480/277-V system as follows:

   a. Phase A: Yellow.
   b. Phase B: Brown.

c. Phase C: Orange.
d. Neutral: White with a colored stripe or gray.
e. Ground: Green.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1 inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

j. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults & manholes. Use Self adhesive markers in pull and junction boxes and in panels and switchboards.

1. Legend: 1/4 inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.

Self-Adhesive: Wire Wraps.

K. Apply identification to conductors as follows:

1. Multiple Power or Lighting Circuits in the Same Enclosure: Use color-coding to identify circuits' voltage and phase.
2. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2 inch high lettering on 1-1/2 inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Emergency system boxes and enclosures.
5. Disconnect switches.
6. Enclosed circuit breakers.
7. Motor starters.
8. Push-button stations.
9. Power transfer equipment.
10. Contactors.
11. Remote-controlled switches.
12. Dimmers.
13. Control devices.
14. Transformers.
15. Telephone switching equipment.
16. Fire alarm master station or control panel.
17. Security-monitoring master station or control panel.

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SECTION 26 05 63

ELECTRICAL TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:

1. Qualifications of testing agencies and their personnel.
2. Suitability of test equipment.
3. Calibration of test instruments.
4. Coordination requirements for testing and inspecting.
5. Reporting requirements for testing and inspecting.

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.

1. Independent Testing Agencies: Independent of manufacturers, suppliers, and installers of components to be tested or inspected.

a. Testing Agency's Field Supervisor for Power Component Testing: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Division 26 power component Sections.

B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.

C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 GENERAL TESTS AND INSPECTIONS

A. If a group of tests are specified to be performed by an independent testing agency, prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for independent agency testing. Include the following minimum preparations as appropriate:

1. Perform insulation-resistance tests.
2. Perform continuity tests.
3. Perform rotation test (for motors to be tested).
4. Provide a stable source of single-phase, 208/120-V electrical power for test instrumentation at each test location.

B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:

1. Manufacturer's written testing and inspecting instructions.
2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
3. Tabulation of expected measurement results made before measurements.
4. Tabulation of "as-found" and "as-left" measurement and observation results.

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SECTION 26 05 72

OVERCURRENT PROTECTIVE DEVICE SHORT CIRCUIT STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections to include the following:

1. Section 26 0573 “Overcurrent Protective Device Coordination Study.”
2. Section 26 0574 “Overcurrent Protective Device Arc Flash Study.”

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

B. DEFINITIONS

1. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
2. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
3. SCCR: Short-circuit current rating.
4. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.3 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.
B. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.

2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

   a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

   b. Revised single-line diagram, reflecting results of short-circuit study and field investigation results.

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with the requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.All overcurrent protective de-vice studies (short circuit, coordination, and arc flash) shall be performed by the same qualified specialist.

C. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:

   1. SKM Systems Analytics, Inc.
   2. ETAP

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current- characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA), voltage ratings, and %Z.
4. Motor and generator designations motor sizes and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.
6. Spare breakers

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calcu-

lated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Calculated asymmetrical fault currents:

      1) Based on fault-point X/R ratio.
      2) Based on calculated symmetrical value multiplied by 1.6.
      3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. No AC Decrement (NACD) ratio.
   e. Equivalent impedance.
   f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
   g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support the short-circuit study.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchboard.
3. Low-voltage switchboard.
4. Control panels.
5. Distribution panelboards.
6. Branch circuit panelboards.
7. Disconnect switches.
8. Variable frequency drives.
9. Lighting and dimming control panels.

3.3 ADJUSTING

A. Make modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

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SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. Section 26 0572 “Overcurrent Protective Device Short Circuit Study”.
2. Section 26 0574 “Overcurrent Protective Device Arc Flash Study.”

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective coordination.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed, and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with the requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Software Developers: Subject to compliance with requirements, provide products by one of the following:

1. SKM Systems Analysis, Inc.
2. ETAP Power System

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. The computer software program shall be capable of plotting and diagramming time-current- characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
   1. Optional Features:
      a. Arcing faults.
      b. Simultaneous faults.
      c. Explicit negative sequence.
      d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA), voltage ratings, and %Z.
4. Motor and generator designations motor sizes and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

E. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available

   a. Phase and Ground Overcurrent Relays:

      1) Device tag.
      2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
      3) Recommendations on improved relaying systems, if applicable.

   b. Magnetic and Solid State type Circuit Breakers:

      1) Adjustable pickups and time delays (long time, short time, ground).
      2) Adjustable time-current characteristic.
      3) Adjustable instantaneous pickup.
      4) Recommendations on improved trip systems, if applicable.

   c. Fuses: Show current rating, voltage, and class.

F. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Prepare separate sets of curves for the switching schemes and for emergency periods where the

power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    f. Cables and conductors damage curves.
    g. Ground-fault protective devices.
    h. Motor-starting characteristics and motor damage points.
    i. Generator short-circuit decrement curve and generator damage point.
    j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Provide adequate time margins between device characteristics such that selective operation is achieved.
6. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:
   a. Inrush current when first energized.
   b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
   c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P- 32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming Switchboard.
3. Low-voltage switchboard.
4. Control panels.
5. Standby generators and automatic or manual transfer switches.
6. Distribution panelboards.
7. Branch circuit panelboards.
8. Disconnect switches.
9. Variable frequency drives.
10. Lighting and dimming control panels.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
11. Maximum demands from service meters.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material, and

conduit material (magnetic or nonmagnetic).

15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
16. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Ratings, types, and settings of utility company's overcurrent protective devices.
    e. Special overcurrent protective device settings or types stipulated by utility company.
    f. Time-current-characteristic curves of devices indicated to be coordinated.
    g. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    h. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    i. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

    1. Perform each visual and mechanical inspection and electrical test

stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.5 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

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SECTION 26 08 00

COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Section includes commissioning process requirements for Electrical and associated controls systems, assemblies, and equipment.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Requirements Division 01, Division 26 Specification Sections, and Common Work Requirements for Electrical apply to the work specified in this Section.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. EOR: Engineer of Record.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 SYSTEMS TO BE COMMISSIONED

A. Electrical systems and equipment including, but not limited to:

1. Lighting Control Devices

a. Occupancy Sensors.
b. Other types of control.

2. Central Lighting Controls

   a. Dimmer Racks.
   b. Lighting Control Panels.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Complete the Cx prefunctional checklists for all commissioned equipment and systems.

B. Perform the Cx functional tests at the direction of the CxA. Resolve any noted deficiencies indicated in the Cx issues log.

C. Coordinate and provide all electrical subcontractor labor and equipment necessary to perform the Cx functional tests, including manufacturer's startup technicians for Electrical equipment with internal controls.

D. Document equipment installation and startup activities as defined by the manufacturer and provide such documentation to the CxA prior to the start of Cx functional tests.

E. Attend Commissioning Meetings during construction as designated by the CxA.

F. Attend construction phase controls coordination meeting.

G. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as called out in the installation specifications.

   1. Provide the CxA with sample training curricula per the General Commissioning Requirements for review and approval a minimum of four (8) weeks prior to the scheduled training.
   2. Provide EOR and CxA copies of O&M Manuals for review a minimum of 8 weeks prior to submission for substantial completion.

H. Provide information requested by the CxA for final commissioning documentation.

I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

J. Provide site and equipment specific operating manuals detailing all manufacturer recommended maintenance procedures, spares lists.

1.6 CxA'S RESPONSIBILITIES

A. Review and Approve Project specific commissioning readiness checklists and commissioning functional test procedures for Electrical systems and associated controls.

B. Develop and distribute the Commissioning Plan.

C. Schedule and conduct Commissioning Meetings during construction as necessary to coordinate commissioning activities within the project delivery team.

D. Oversee commissioning functional testing.

E. Assemble contractor provided test data, inspection reports, and certificates in Systems Manual.

F. Review and recommend for approval the Training curriculum provided by individual contractors.

G. Review and recommend for approval the Installation, Maintenance and Operations manuals.

1.7 COMMISSIONING DOCUMENTATION

A. Contractor shall provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Electrical systems, assemblies, equipment, and components to be verified and tested.
4. Cx readiness certificates of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that Electrical systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Point to Point verification documentation of all systems. TCC shall provide this in their format and shall show initial readings, calibration adjustments and final readings. This is to the extent that Electrical system is integrated into the TC system.

1.8 CLOSEOUT SUBMITTALS

A. Certificates of completion and completed checklists for installation, prestart, and startup activities for each piece of commissioned equipment prior to the start of commissioning testing activities.

B. Installation, Operations and Maintenance Manuals.

C. Training information, including all curricula, manuals, visual aids and trainer qualifications for each piece of equipment so called out in the installation specifications. Information shall be submitted for approval to the CxA a no later than three (3) weeks prior to proposed training.

D. Filled out and signed Cx readiness checklists and signed Cx functional test scripts during testing.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that Electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents Description.

B. Set systems, subsystems, and equipment into operating mode to be tested. Inspect and verify the position of each device and interlock identified on checklists.

C. Check safety cutouts, alarms, and interlocks with smoke control and life safety systems during each mode of operation.

3.2 GENERAL TESTING REQUIREMENTS

A. Provide contractor and subcontractor technicians, instrumentation, and tools to perform commissioning functional tests at the direction of the CxA.

B. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

C. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

D. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

E. The Design Builder shall ensure that the Electrical and controls subcontractors provide qualified technicians to execute the Cx functional tests under observations by the CxA.

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SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Remote control lighting relays.
2. Lighting contactors.
3. Switches.
4. Switch plates.
5. Occupancy sensors.
6. Photocells.
7. Photocell control unit.

B. Related Sections:

1. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
2. Section 26 0533 - Raceway and Boxes for Electrical Systems: Product requirements for raceway and boxes for placement by this section.
3. Section 26 0553 - Identification for Electrical Systems: Product requirements for electrical identification items for placement by this section.
4. Section 26 2416 - Panelboards.
5. Section 26 2726 - Wiring Devices: Product requirements for wiring devices for placement by this section.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
5. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
6. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

1.3 SYSTEM DESCRIPTION

A. Distributed switching control using self-contained individually mounted lighting relays.

B. Where indicated on drawings or required by applicable code, provide automatic shutoff for lighting inside building larger than 5000 square feet (465 square meters). Control shutoff by method conforming to ICC IECC.

C. Where indicated on drawings or required by applicable code, provide automatic shutoff for lighting outside building. Control shutoff by method conforming to ICC IECC.

1.4 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

   a. Submit manufacturer's standard product data for each system component.

2. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.

   a. One Line Diagram: Indicating system configuration indicating panels, number and type of switches or devices.
   b. Include typical wiring diagrams for each component.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record the following information:

1. Locations of components and record circuiting and switching arrangements.
2. Wiring diagrams reflecting field installed conditions with identified and numbered system components and devices.

B. Operation and Maintenance Data:

1. Submit replacement parts numbers.
2. Submit manufacturer's published installation instructions and operating instructions.
3. Recommended renewal parts list.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section .

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept components in pre-fab or on site in manufacturer's packaging. Inspect for damage.

B. Protect components by storing in manufacturer's containers indoor protected from weather.

1.8 WARRANTY

A. Furnish five year manufacturer warranty for components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Lithonia Lighting; Acuity Lighting Group, Inc.

B. Wattstopper (The).

C. Or approved equal.

2.2 REMOTE CONTROL LIGHTING RELAYS

A. Product Description: Heavy duty, single-coil momentary contact mechanically held remote control relays.

B. Contacts: Rated 20 amperes at 277 volts. Rated for lighting applications compatible with the fixture type being controlled.

C. Line Voltage Connections: Clamp type screw terminals.

D. Enclosure: NEMA ICS 6, to meet conditions.

2.3 LIGHTING CONTACTORS

A. Product Description: NEMA ICS 2, magnetic lighting contactor.

B. Poles: To match circuit configuration and control function.

C. Contact Rating: Conductor overcurrent protection, considering derating for continuous loads.

D. Enclosure: NEMA ICS 6, to meet conditions.

2.4 SWITCHES AND SWITCH PLATES

A. Refer to WIRING DEVICES 26 27 26

2.5 OCCUPANCY SENSOR

A. Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

B. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 30 seconds to 12 minutes.

C. Furnish with manual override.

D. Operation: Silent.

E. Room Sensors: As indicated on Drawings.

F. Corridor and Hallway Sensors:

1. Capable of detecting motion 14 feet (4 m) wide and 80 feet (24 m) long with one sensor mounted 10 feet (3 m) above floor.
2. Capable of being wired in master-slave configuration to extend area of coverage.

2.6 PHOTOCELLS

A. General: Consist of sensor mounted with separate control-calibration module. Sensor connected to control-calibration module via single shielded conductor with maximum distance of 500 feet (150 m). Control unit powered by 24 VAC.

2.7 PHOTOCELL CONTROL UNIT

A. Product Description: Photodiode control unit with PHOTOCELL ENABLE and MASTER OVERRIDE inputs for remote control.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount switches and occupancy sensors as indicated on Drawings.

B. Install wiring in accordance with Section 26 05 19.

C. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.

D. Label each low voltage wire with relay number at each switch or sensor.

3.2 MANUFACTURER'S FIELD SERVICES

A. Furnish services for a minimum of one day for check, test, and start-up. Perform the following services:

1. Check installation of panelboards.
2. Test operation of remote-controlled devices.
3. Repair or replace defective components.

3.3 ADJUSTING

A. Test each system component after installation to verify proper operation.

B. Test relays, contactors, and switches after installation to confirm proper operation.

C. Confirm correct loads are recorded on directory card in each panel.

3.4 SCHEDULES

A. Lighting Relay Schedule:

Panel Name and Location									
Panel Number									
Relay Number	R1	R2	R3	R4	R5	R6	R7	R8	R9
Panel and Circuit									
Description									
Switch or Sensor									
Switch or Sensor									

B. Lighting Contactor Schedule:

Panel Name and Location									
Panel Number									
Contactor Number	C1	C2	C3	C4	C5	C6	C7	C8	C9
Panel and Circuit									
Description									
Switch or Sensor									
Switch or Sensor									

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SECTION 26 09 43

NETWORK LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. LED drivers.
2. Power interfaces.
3. Main units.
4. Lighting control modules.
5. Energy meter.
6. Lighting management hubs.
7. Lighting management system computers.
8. Lighting management system software.
9. Control stations.
10. Low-voltage control interfaces.
11. Wired sensors.
12. Accessories.

B. Related Work: Consult all other Sections, determine the extent and character of work-related work.

C. Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1. Division 12 - Motorized roller window shades, for interface with lighting control system.
2. Division 25 – Integrated Automation.
3. Section 26 0553: Electrical Identification - Identification products and requirements.
4. Section 26 2726: Wiring Devices
5. Section 26 5100: Lighting – Luminaires, LED Drivers.
6. Finish requirements for wall controls specified in this section.
7. Accessory receptacles and wall plates, to match lighting controls specified in this section.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. National Electrical Manufacturer Association (NEMA):

   a. NEMA 250; Enclosures for Electrical Equipment.
   b. NEMA ICS 1; Industrial Control and Systems.
   c. NEMA ICS 4; Terminal Blocks and Industrial use.
   d. NEMA ICS 6; Enclosures for Industrial Controls and Systems.

2. Underwriters Laboratories, Inc. (UL):

   a. UL 50; Cabinets and Boxes.
   b. UL 773A; Non-industrial Photoelectric Switches for Lighting Control.
   c. UL 916; Energy Management.

1.3 SYSTEM DESCRIPTION

A. The lighting control system specified in this section shall provide time-based, sensor based (both occupancy and daylight), and manual lighting control.

B. The primary function of the system shall be turning lighting loads on/off, and dimming lights.

C. All system devices shall be networked together enabling digital communication and shall be individually addressable.

D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.

E. The system architecture shall facilitate remote operation via a computer connection.

F. The system shall not require any centrally hardwired switching equipment

G. This system will communicate with the HUCLA Medical Center System.

H. System capable of providing all the required controls as mandated by the Title-24.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall controls with actual installed door swings.
3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-installation Meeting: Conduct on-site meeting with lighting control system manufacturer prior to commencing work as part of manufacturer's standard startup services. Manufacturer to review with installer:

1. Low voltage wiring requirements.
2. Separation of power and low voltage/data wiring.
3. Wire labeling.
4. Lighting management hub locations and installation.
5. Sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
6. Control locations.
7. Computer jack locations.
8. Local circuit wiring.
9. Network wiring requirements.
10. Connections to other equipment.
11. Installer responsibilities.

C. Sequencing:

1. Do not install sensors and wall controls until initial surface finishes and painting are complete.

1.5 SUBMITTALS

A. Submit in accordance with the Section 26 05 00, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

a. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.

2. Describe system operation, equipment and dimensions and indicate features of each component.
3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

4. Shop Drawings to include:

   a. Complete bill of materials listing all components.
   b. Plot plans and building floor plans, showing location of and conduit routing to all devices.
   c. Point-to-Point wiring diagram in block or riser format showing all low voltage lighting control components, conduit and wire types and sizes with cable legend.
   d. Include requirements for interface with other systems.
   e. Provide detailed sequence of operations describing system functions.
   f. Include elevations of main controller.

5. Submit Manufacturer's installation instructions. Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
6. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 under “COMMISSIONING”.

1.6 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals in accordance with the requirements of Section

B. Basic Electrical Requirements to include the following:

1. Operation and maintenance manuals shall include the following:

   a. A detailed explanation of the operation of the system.
   b. Instructions for routine maintenance, including recommended maintenance procedures and intervals.
   c. Pictorial parts list and part numbers.

d. Shop drawings to include the following:

1) Floor plans showing actual installed locations of lighting fixtures, wall controllers, occupancy and daylight sensors, main units, control and interface modules, etc.
2) Show network communication cabling and pre-fabricated lengths.
3) Indicate device addresses.
4) Riser diagram indicating system backbone and headend connections.

e. Telephone numbers for the authorized parts and service distributors.
f. Final testing report.

1.7 QUALITY ASSURANCE

A. Conform to the requirements of NFPA 70.

B. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.

C. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

D. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

E. Manufacturer Qualifications:

1. Company with experience manufacturing lighting control systems of similar complexity to specified system.
2. Registered to ISO 9001, including in-house engineering for product design activities.
3. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

F. Title 24 Acceptance Testing Technician Qualifications: Certified by a California approved Acceptance Test Technician Certification Provider as an Acceptance Test Technician (ATT) in accordance with CAL TITLE 24 P6.

G. Maintenance Contractor Qualifications: Manufacturer's authorized service representative.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Addressable lighting control components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.

B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.

C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.9 WARRANTY

A. Units and components offered under this Section shall be covered by a 2-year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner. Warranty shall include:

1. 100 percent parts and labor coverage for first two years for lighting control system components, except system computer and ballasts/drivers.
2. First-available on-site or remote response time.
3. Telephone technical support; 24 hours per day, 7 days per week, excluding manufacturer holidays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Network lighting control system:

a. Lutron “Quantum”
b. LC&D
c. nLight.

2.2 GENERAL

A. Sensor Layout and Tuning: Include Lighting Control Manufacturer's Sensor Layout and Tuning service.

1. Lighting Control Manufacturer to take full responsibility for sensor layout and performance for sensors provided by Lighting Control Manufacturer.
2. Lighting Control Manufacturer to analyze the reflected ceiling plans, via supplied electronic AutoCAD format, and design a detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize the layouts for sensor placement.
3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require a deviation from locations specified in the drawings.
4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per the agreed upon sequence of operations.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

D. Design lighting control equipment for 10-year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

E. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2. F. Dimming and Switching (Relay) Equipment:

1. Designed so that electrolytic capacitors operate at least 36 degrees F (20 degrees C) below the capacitor's maximum temperature rating when the device is under fully loaded conditions at maximum rated temperature.
2. Inrush Tolerance:

   a. Utilize load-handling thyristors (SCRs and triacs), field effect transistors (FETs) and isolated gate bipolar transistors (IGBTs) with maximum current rating at least two times the rated operating current of the dimmer/relay.

b. Capable of withstanding repetitive inrush current of 50 times the operating current without impacting lifetime of the dimmer/relay.

3. Surge Tolerance:

a. Panels: Designed and tested to withstand surges of 6,000 V, 3,000 amps according to IEEE C62.41.2 and IEC 61000-4-5 without impairment to performance.
b. Other Power Handling Devices: Designed and tested to withstand surges of 6,000 V, 200 amps according to IEEE C62.41.2 without impairment to performance.

4. Power Failure Recovery: When power is interrupted and subsequently restored, within 3 seconds lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
5. Dimming Requirements:

a. Line Noise Tolerance: Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage per cycle), frequency shifts (plus or minus 2 Hz change in frequency per second), dynamic harmonics, and line noise.

1) Systems not providing integral cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.

b. Incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to the appropriate levels within 0.5 seconds.
c. Utilize air gap off to disconnect the load from line supply.
d. Control all light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable.
e. Load Types:

1) Assign a load type to each dimmer that will provide a proper dimming curve for the specific light source to be controlled.
2) Provide capability of being field configured to have load types assigned per circuit.

f. Minimum and Maximum Light Levels: User adjustable on a circuit-by-circuit basis.
g. Line Voltage Dimmers:

1) Dimmers for Magnetic Low Voltage (MLV) Transformers:

a) Provide circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
b) Dimmers using unipolar load current devices (such as FETs or SCRs) to include DC current protection in the event of a single device failure.

2) Dimmers for Electronic Low Voltage (ELV) Transformers: Operate transformers via reverse phase control. Alternately, forward phase control dimming may be used if dimming equipment manufacturer has recommended specific ELV transformers being provided.

h. Low Voltage Dimming Modules:

1) Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to a single zone.
2) Single low voltage dimming module; capable of controlling the following light sources:

a) 0-10V analog voltage signal.

(1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
(2) Sink current according to IEC 60929.
(3) Source current.

b) 10-0V reverse analog voltage signal.
c) DSI digital communication.
d) DALI broadcast communication per IEC 60929:

3) Logarithmic intensity values complying with IEC 60929.
4) Linear intensity values for use with LED color intensity control.

a) PWM per IEC 60929.

6. Switching Requirements:

a. Rated Life of Relays: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
b. Switch load in a manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
c. Provide output fully rated for continuous duty for inductive, capacitive, and resistive loads.

F. Device Finishes:

1. Wall Controls: Color to be selected by Architect.
2. Standard Colors: Comply with NEMA WD1 where applicable.
3. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request. H. Interface with building automation system as specified in Division 25.

2.3 LED DRIVERS

A. General Requirements:

1. Designed for 10-year operational life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
2. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
3. UL 8750 recognized or listed as applicable.
4. Complies with IEC 61347-2-13 as applicable.
5. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
6. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
7. Class A sound rating; Inaudible in a 27 dBA ambient.
8. No visible change in light output with a variation of plus or minus 10 percent line voltage input.
9. Total Harmonic Distortion (THD): Less than 20 percent for loads greater than 25W; comply with ANSI C82.11.
10. Drivers to track evenly across multiple lamp lengths and all light levels.
11. Configuration tool available to optimize the following for LED fixtures:

    a. Light level.
    b. Efficacy.
    c. Thermal performance.

B. Digital Control:

1. Lights automatically return to the setting prior to power interruption.
2. Operate from input voltage of 120 V through 277 V at 60 Hz.
3. Each driver responds independently to:

    a. Up to 32 occupant sensors.
    b. Up to 16 daylight sensors.

4. Responds to digital load shed command. (Example: If light output is at 30 percent and a load shed command of 10 percent is received, the ballast automatically sets the maximum light output at 90 percent and lowers current light output by three percent to 27 percent).

C. Product(s):

1. Forward Phase (Neutral Wire Required), and Digital Control, One Percent Dimming:

a. Dimming Range: 100 to one percent relative light output.
b. Maximum Inrush Current: 2 amperes for 120 V and 277V drivers.

c. Constant Current Drivers:

1) Support from 200 mA to 2.1 A (in 10 mA steps) to ensure a compatible driver exists.

2) Support LED arrays up to 40W or 53 W (710 mA to 1.05 A in 10 mA steps).

d. Constant Voltage Drivers:

1) Support from 10 V to 60 V (in 0.5 V steps) to ensure a compatible driver exists.

2) Support LED arrays up to 40W.

2. Digital Control, Five Percent Dimming:

a. Dimming Range: 100 to five percent relative light output.
b. Maximum Inrush Current: Meets NEMA 410 inrush requirements.

c. Constant Current Drivers:

1) Support from 220 mA to 1.4 A to ensure a compatible driver exists.
2) Support LED arrays up to 60W.

2.4 POWER INTERFACES

A. Provide power interfaces as indicated or as required to control the loads as indicated.

B. General Requirements:

1. Phase independent of control input.

2. Rated for use in air-handling spaces as defined in UL 2043.
3. Utilize air gap off to disconnect the load from line supply.
4. Diagnostics and Service: Replacing power interface does not require reprogramming of system or processor.

C. Product(s):

1. Phase-Adaptive Power Module: Provides interface for phase control input to provide full 16 A circuit output of forward/reverse phase control for compatible loads.
2. Switching Power Module: Provides interface for phase control or switched input to provide full 16 A circuit output of switching for compatible non-dim loads.

3. Phase-Adaptive Power Module with 3-Wire LED Input: Provides interface for fluorescent ballast/LED driver control input to provide full 16 A circuit output for compatible loads.
4. Ten Volt Interface; Lutron GRX-TVI: Provides interface for phase control input to provide full 16 A circuit output of switching and 0-10 V low voltage control for compatible fluorescent electronic dimming ballasts or LED drivers.

2.5 MAIN UNITS

A. Provide main units with configuration and quantity of zones as indicated or as required to control the loads as indicated.

B. Connects to lighting management hub via RS485.

C. Finish: Custom colors to be selected by Architect.

D. Engrave units with button, zone, and scene descriptions to be selected by Architect and owner.

E. Integrated Wireless Capability:

1. Provide wireless communication inputs for:

a. Occupancy sensors.
b. Daylight sensors.
c. Wireless controller.

1) RF Range: 30 feet (9 m) between sensor and compatible RF receiving device(s).

2) RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.

2. Preset Lighting Control with Zone Override:

   a. Intensity for each zone indicated by means of one illuminated bar graph per zone.
   b. User-programmable zone and scene names.
   c. Utilize air gap off to disconnect the load from line supply.

3. Astronomical time clock and programmer interface provides access to:

   a. Scene selections.
   b. Fade zone to a level.
   c. Fine-tuning of preset levels with scene raise/lower.
   d. Lock out scenes and zones.
   e. Fine-tuning of light levels with individual zone raise/lower.
   f. Terminal block for wired infrared signal input.
   g. Enable/disable wall station.

4. Light intensity with real time energy savings by digital display.
5. Fade time indicated by digital display for current scene while fading.
6. Integral wide-angle infrared receiver.
7. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.
8. Direct Low-Voltage Control of Digital LED drivers (120V, 220/240V, 277V and/or 347V Lighting):

   a. Electronically link a digital LED driver to a zone for both dimming and turning
   b. on/off.
   c. Electronically assign daylight sensors to digital LED drivers and line voltage
   d. dimmers for proportional daylight harvesting.
   e. Single integral controller with Class 1 or Class 2 isolated digital output signal
   f. conforming to IEC 60929; capable of direct control without interface.

9. Creates daylighting rows independent of control zones.
10. Capable of re-zoning without re-wiring using programming display on unit.
11. Outputs shall be virtually mapped to other device's outputs.
12. Zone raise/lower buttons capable of controlling local lighting loads connected to the main unit or remote lighting zones in the system.

F. Preset Shade Control with Zone Override:

1. Preset expandable shade control: Provide up to three columns of shade control.
2. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.

G. Provides one direct-wired occupancy sensor connection without interface or power pack.

2.6 LIGHTING CONTROL MODULES

A. Provide lighting control modules as indicated or as required to control the loads as indicated.

B. General Requirements:

1. Listed to UL 508 as industrial control equipment.
2. Delivered and installed as a listed factory-assembled panel.
3. Passively cooled via free-convection, unaided by fans or other means.
4. Mounting: Surface.

5. Connection without interface to wired:

   a. Occupancy sensors.
   b. Daylight sensors.
   c. IR receivers for personal control.

6. Connects to lighting management hub via RS485.
7. LED status indicators confirm communication with occupancy sensors, daylight sensors, and IR receivers.
8. Contact Closure Input:

   a. Directly accept contact closure input from a dry contact closure or solid-state output without interface to:

      1) Activate scenes.

         a) Scene activation from momentary or maintained closure.

      2) Enable or disable after hours.

         a) Automatic sweep to user-specified level after user-specified time has elapsed.
         b) System will provide occupants a visual warning prior to sweeping lights to user-specified level.
         c) Occupant can reset timeout by interacting with the lighting system.

3) Activate or deactivate demand response (load shed).

a) Load shed event will reduce lighting load by user-specified amount.

9. Emergency Contact Closure Input:

a. Turn all zones to full output during emergency state via direct contact closure input from UL 924 listed emergency lighting interface, security system or fire alarm system.
b. Allow configurable zone response during emergency state.
c. Disable control operation until emergency signal is cleared.

10. Supplies power for control link for keypads and control interfaces.
11. Distributes sensor data among multiple lighting control modules.
12. Capable of being controlled via wireless sensors and controls.

C. Switching Lighting Control Modules:

1. Switching:

a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
d. Module to integrate up to four individually controlled zones.
e. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply. D. 0-10V Lighting Control Modules:

2. Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to single zone.
3. Single low voltage dimming module; capable of controlling following light sources:

a. 0-10V analog voltage signal.

1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
2) Sink current per IEC 60929.

b. 10V-0V analog voltage signal.

1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
2) Sink current per IEC 60929.

4. Switching:

a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
d. Module to integrate up to four individually controlled zones.
e. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.

D. Digital Fixture Lighting Control Modules:

1. Provides two-way feedback with digital fixtures for energy monitoring, light level status, lamp failure reporting, and ballast/driver failure reporting.
2. Provide testing capability using manual override buttons.
3. Each low-voltage digital communication link to support up to 64 ballasts or LED drivers capable of NFPA 70 Class 1 or Class 2 installation.

E. Total Light Management Control Module (Digital Lighting and Shades Control):

1. Ten fused 30W (60W peak) 24V DC outputs provide power to compatible shades, drapery drive units, keypads, and accessories.
2. Provide power for 10 to 30 shades dependent on shade dimensions.
3. Provide smart diagnostics for system verification.
4. Provide testing capability using manual override buttons.
5. Each low-voltage digital communication link to support up to 64 ballasts capable of NFPA 70 Class 1 or Class 2 installation.

2.7 ENERGY METER

A. General Requirements:

1. Provides accurate, real-time energy metering and verification capability through frontend PC-based software.
2. Factory-calibrated; not requiring preventative/scheduled maintenance or cleaning/decontamination procedures.
3. Accepts up to three sets of current sensors to monitor up to three loads of the same voltage with one meter.
4. Contains direct-read 8-digit LCD display of cumulative kWh.

5. Current Sensors: Split-core; capable of being placed up to 500 feet (152 m) from the meter without power interruption.
6. Connects to server via Ethernet.
7. UL listed.
8. Accuracy: Plus/minus 0.5 percent, certified to ANSI C12.20.
9. NEMA 12 housing.
10. Provide voltage and current rating suitable for the installation location.

2.8 LIGHTING MANAGEMENT HUBS

A. Provided in a pre-assembled NEMA listed enclosure with terminal blocks listed for field wiring.

B. Connects to controls and power panels via RS485.

C. Enables light management software to control and monitor compatible dimming ballasts and ballast modules, power panels, power modules, and window treatments.

1. Utilizes Ethernet connectivity to light management computer utilizing one of the
2. following methods:

    a. Dedicated network.
    b. Dedicated VLAN.
    c. Shared network with Building Management System (BMS).
    d. Corporate network where managed switches are configured to allow multicasting and use of IGMP.

D. Integrates control station devices, power panels, shades, preset lighting controls, and external inputs into a single customizable lighting control system with:

1. Multiple Failsafe Mechanisms:

    a. Power failure detection via emergency lighting interface.
    b. Protection: Lights go to full on if ballast wires are shorted.
    c. Distributed architecture provides fault containment. Single hub failure or loss of power does not compromise lights and shades connected to other lighting management hubs.
2. Manual overrides.
3. Automatic control.
4. Central computer control and monitoring.
5. Integration with BMS via BACnet.

E. Furnished with astronomical time clock.

F. Furnished with solar clock to track the position of the sun to control the shades to limit penetration of direct sunlight.

G. Maintains a backup of the programming in a non-volatile memory capable of lasting more than ten years without power. H. BACnet Integration License:

1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
2. Requires only one network connection per system.
3. Lighting control system to be BACnet Test Laboratory (BTL) listed.

4. Basic BACnet integration license:

a. The BACnet integrator can command:

1) Area light output.
2) Area enable or disable after hours mode.
3) Area load shed level.
4) Area load shed enable/disable.
5) Area shade group presets and levels.
6) Enable/Disable:

a) Automated solar adaptive shade control.
b) Cloudy day/shadow override mode for automated shade control.
c) Brightness override mode for automated shade control.
d) Area occupancy sensors.
e) Area daylighting.

7) Daylight level.
8) Area occupied and unoccupied level.
9) Occupancy sensor timeouts.

b. The BACnet integrator can monitor:
1) Area on/off status.
2) Area occupancy status.
3) Area fault.

a) Lamp failures.
b) Control devices not responding.

4) Area load shed status.
5) Area instantaneous energy usage and maximum potential power usage.

6) Energy savings broken out by strategy (occupancy, timeclock, daylighting, personal control, tuning, load shed) down to the individual area.
7) Area shade group presets and levels.
8) Cloudy day and shadow sensor status.
9) Light levels from window mounted sensors.
10) Enable/Disable:

a) Status of automated solar adaptive shade control.
b) Status of cloudy day/shadow override for automated shade control.
c) Status of brightness override for automated shade control.
d) Area occupancy sensors.
e) Daylighting.

11) Daylighting level.
12) Light levels from photo sensors and window mount shadow sensors.
13) Area occupied and unoccupied level.
14) Occupancy sensor timeouts.

c. Shade assignment and grouping to be discoverable with third party building management software.

2.9 LIGHTING MANAGEMENT SYSTEM COMPUTERS

A. Computers:

1. Provide server and workstation as specified unless more stringent requirements per manufacturers.
2. System IP (Desktop/Laptop):

a. Suitable for occasional programming, monitoring, and control of digital network lighting controls.
b. Unless otherwise indicated, computer(s) shall be provided by lighting control system manufacturer.
c. Quantity: To be determined.
d. Location(s): As directed by Owner.
e. Minimum Hardware Requirements:

1) Provide quantity as indicated in the system integration diagram.
2) Processor: Single Intel® Xeon® processor with minimum speed of 2.0 GHz.
3) 1 GB RAM.
4) 80 GB hard drive (30 GB for application).

5) One 10/100/1000 Ethernet network interface for communication with lighting management hubs.
6) 17-inch (43 cm) monitor with 1024 x 768 resolution.
7) 48X CD/DVD-ROM drive.
8) 4 USB 2.0 ports.

f. Minimum Software Requirements:

1) Licensed installation of US English 32-bit or 64-bit Microsoft® Windows® Server 2008 with Service Pack 1.

3. Server:

a. Suitable for 24 hour per day, 7 day per week programming, monitoring, control, and data logging of digital-network lighting controls.
b. Suitable to handle client machine request in multi-computer systems.
c. Unless otherwise indicated, computer(s) to be provided by lighting control system manufacturer.
d. Minimum Hardware Requirements:

1) Processor: Dual Core Intel® processor with minimum speed of 1.86 GHz.
2) 2 GB Ram.
3) 80 GB hard drive (30 GB for application).
4) Two 10/100/1000 Ethernet network interfaces - one for communication with lighting management hubs and one for communication with corporate intranet to allow access from system PCs and/or energy saving display terminals. Only one Ethernet network interface is required if all lighting management hubs and client PCs are on the same network.
5) 17-inch (43 cm) monitor with 1024 x 768 resolution.
6) 48X CD/DVD-ROM drive.
7) 4 USB 2.0 ports.

e. Minimum Software Requirements:

1) Licensed installation of US English 32-bit or 64-bit Microsoft® Windows® Server 2008 with Service Pack 1.

4. Energy Savings Display Terminals:

a. Suitable for displaying energy savings data on user-supplied display.
b. Unless otherwise indicated, computer(s) to be provided by lighting control system manufacturer.
c. Quantity: To be determined.
d. Location(s): As directed by Owner.
e. Minimum Hardware Requirements:

1) Processor: Single Intel® Xeon® processor with minimum speed of 2.0 GHz.
2) 1 GB RAM.
3) 80 GB hard drive (30 GB for application).
4) One 10/100/1000 Ethernet network interface for communication with lighting management hubs.
5) 17-inch (43 cm) monitor with 1024 x 768 resolution.
6) 48X CD/DVD-ROM drive.
7) 4 USB 2.0 ports.

f. Minimum Software Requirements:

1) Licensed installation of US English 32-bit or 64-bit Microsoft® Windows® Server 2008 with Service Pack 1.

5. Computers Provided by Lighting Control System Manufacturer: Computer software to be preinstalled and tested prior to shipping.

2.10 LIGHTING MANAGEMENT SYSTEM SOFTWARE

A. Provide system software license and hardware that is designed, tested, manufactured, and warranted by a single manufacturer.

B. Configuration Setup Software:
1. Suitable to make system programming and configuration changes.
2. Windows-based, capable of running on either central server or a remote client over TCP/IP connection.
3. Allows manufacturer, either remotely or with on-site service call, or end-user with training, to:

a. Capture system design:

1) Geographical layout.
2) Load schedule zoning.
3) Shade grouping.
4) Equipment schedule.
5) Equipment assignment to lighting management hubs.
6) Daylight design.

b. Define the configuration of the following in each area:
1) Lighting scenes.
2) Shade group presets.
3) Control station devices.
4) Interface and integration equipment.

5) Occupancy/after hours.
6) Partitioning.
7) Daylighting.
8) Emergency lighting.
9) Night lights.

C. Startup:

1. Addressing.
2. Daylighting.
3. Provide customized conditional programming.

D. Control and Monitor Software:

1. Accessibility and Platform Support:

a. Web-Based Application:

1) Web-based; runs on most HTML5 compatible browsers (including Internet Explorer, Chrome, and Safari).
2) Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone; optimized for displays of 1024 by 768 pixels or higher.
3) User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
4) Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).

b. Desktop Application:

1) Client installation for Windows-based operating systems only.

2. System Navigation and Status Reporting:

a. Web-Based Application: Performed using graphical floor plan view or a generic system layout.

1) Graphical Floor Plan View: Utilizes customized CAD based drawing of the building. Pan and zoom feature allows for easy navigation; dynamically adjusts the details presented based on zoom level.
2) Area, scene, and zone names shall be changed in real time.

b. Desktop Application: Performed using basic system tree view.

3. Control of Lights:

a. Area lights shall be monitored for on/off status.
b. All lights in an area shall be turned on/off or sent to a specific level.
c. For areas that have been zoned, these areas may be sent to a predefined lighting scene, and individual zones may be controlled.
d. Area lighting scenes shall be renamed and modified in real-time, changing the levels that zones go to when a scene is activated.
e. High and low end of area lighting shall be tuned/trimmed.
f. Control and monitor area partition status.

4. Control of Shades:

   a. Area shades shall be monitored for current preset or position.
   b. Area shades shall be opened/closed, sent to a preset, or sent to a specific position.

5. Occupancy:

   a. Area occupancy shall be monitored.
   b. Area occupancy shall be disabled to override occupancy control or in case of occupancy sensor problems.
   c. Area occupancy settings including level that lights turn on to when area is occupied, and level that lights turn off to when area is unoccupied shall be changed in real-time.
   d. Monitor energy savings due to occupancy down to an individual area.

6. Daylighting:

   a. Daylighting shall be enabled/disabled. Shall be used to override the control currently taking place in the space.
   b. The following is particularly useful when new departments move into a space.
   c. Daylight calibration shall be adjusted for each daylit area.
   d. Daylight status shall be monitored.
   e. Monitor energy savings due to daylight harvesting down to an individual area.

7. Load Shedding: Allows the building manager to monitor whole building lighting power usage and apply a customized load shed reduction to selected areas, thereby reducing a building's power usage; load shedding triggered via Quantum software, BACnet, or OpenADR.
8. Scheduling: Schedule time of day and astronomic time clock events to automate functions.

   a. Adjust or disable a single occurrence of a repeating scheduled event.

b. Easily monitor and adjust scheduled events using a weekly calendar view.

9. Reporting: Provide reporting capability that allows the building manager to gather real-time and historical information about the system as follows:

   a. Energy Reports: Show a comparison of cumulative energy used over a period of time for one or more areas or meter groups.
   b. Power Reports: Show power usage trend over a period of time for one or more areas or meter groups.
   c. Energy Density Report: Show energy usage in W/sq ft.
   d. Energy Savings by Strategy Report: Show energy savings for any area broken down by strategy (tuning, occupancy, daylighting, scheduled events, personal control, and load shedding).
   e. Activity Report: Show what activity has taken place over a period of time for one or more areas. Activity includes occupant activities (e.g. wall controls being pressed), building manager operation (e.g. controlling/changing areas using the control and monitor tool), and device failures (e.g. keypads or ballasts that are not responding).

      1) Include shade related activities (e.g. automatic movements from automated shade algorithm, manual overrides from personal controls, automatic overrides from sensors).

   f. Lamp Failure Report: Shows which areas are currently reporting lamp failures.
   g. Shade Level Report: Shows the shade level for any shade group in the system over any historical 24-hour period.
   h. Shade Position Report: Shows the percentage of time shade groups in the system are at each position.
   i. Sensor Level Report: Shows the light level in footcandles of any photosensor in the system.
   j. Alert Activity Report: Capable of generating historical reports of all alert activity within the system.
   k. Automated Shade Control Activity Report: A chart that combines multiple data points regarding the position and performance of automated shades.

10. Diagnostics: Allows the building manager to check on the status of all equipment in the lighting control system. Devices to be listed with a reporting status of OK, missing, or unknown.
11. Alerts and Alarms: Monitors the system for designated events/triggers and automatically generates alerts according to configured response criteria.

   a. Capable of monitoring for the following events/triggers:

1) A failed piece of equipment (e.g. ballast, control, sensor, etc.); alert cleared when equipment is replaced.
2) A lamp outage (for compatible EcoSystem digital electronic dimming ballasts only); alert cleared when lamp is replaced.
3) Low battery conditions in battery-operated sensors and controls; alert cleared when battery is replaced.
4) Luminaires with lamp operating hours in excess of designated time.
5) A load shed event; alert generated for beginning and end of trigger.
6) Energy usage higher than designated threshold target.
7) Potential light level condition discrepancies (daylight sensors not agreeing with expected lighting status).

b. View alerts on a customized graphical floor plan.
c. Capable of generating alerts through visible changes in software or through email messages.
d. Capable of customizing the frequency of alerts and providing notifications immediately or through daily, weekly, or monthly summaries.
e. Capable of sending different alerts to different system users.
f. Capable of generating historical reports of all alert activity within the system.

12. Administration:

a. Users: Allows new user accounts to be created and existing user accounts to be edited.

1) Supports Active Directory (LDAP) tying user accounts to network accounts.

b. Area and feature access shall be restricted based on login credentials with three levels of access rights (Admin, Programmer, Controller) and customized access levels available.
c. Publish Graphical Floor Plan: Allows admin user to publish new graphical floor plan files, allowing users to monitor the status of lights, occupancy of areas, and daylighting status.
d. Back-Up Project Database: Allows admin user to back up the project database that holds all the configuration information for the system, including keypad programming, areas scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.
e. Publish Project Database: Allows admin user to send a new project database to the server and download the new configuration to the system. The project database holds all the configuration information

for the system, including keypad programming, area scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.

13. Favorite Buttons: Provide global scene control or modes of operation across the entire system.
14. Provides control/monitoring of partition status to automatically reconfigure how the space operates based on the partition's open/closed status.

E. Energy Saving Display Software:

1. Provide software from a single manufacturer that can collect and display real time and historical energy savings data from all of the components in the lighting control system or from the meters in the system.
2. Energy savings data to be accessible for display on computer terminal or user supplied display monitor via energy savings display software.
3. Software to be capable of displaying:

    a. Current savings in percent and kW.
    b. Historic energy savings in kWh saved, money saved, coal not burned, and carbon dioxide not emitted.
    c. Historical views in time periods of three hours, one day, one week, one month, and one year.
    d. Configurable energy usage baseline and user-defined working hours for energy saving calculations.
    e. Comparisons of historical periods (days, weeks, months, years).
    f. Local weather conditions.

F. Web Services Integration License:

1. Provide ability to communicate by means of XML web services.
2. Web services integrator can monitor:

    a. Area instantaneous power usage.
    b. Ara instantaneous power savings.
    c. Area energy savings.
    d. Area energy usage.
    e. Area maximum power usage.

3. Initiate load shed event using OpenADR protocol in an auto-Demand-Response event without additional interfaces or gateways.
4. Supports both push and pull for integration with third party systems and energy dashboards.

G. Mobile Control and Programming Software License:

1. Allows mobile control and programming of system via an Apple iPad.
2. Provides users the ability to:

    a. Control and monitor area lighting scenes, zones, and shade presets.
    b. Easily identify zones and shade groups.
    c. Edit area lighting scenes, shade presets, scene fade rates, and scene delay rates.
    d. Restrict user access by area.
    e. Restrict users from ability to make changes.
    f. Historical logging of who made changes available in control and monitor software.

3. Connects to system via Wi-Fi.
4. Can connect directly to processor or through computer (server) in the system.

H. Personal Web-Based Control Software:

1. Lighting Control: Allows the user to use a web browser on their personal PC, laptop, or some mobile devices (supporting 1024 by 768 resolution) to control one or more lights in their area.

    a. The user may select between full on, full off, or a favorite light level.
    b. The user may raise/lower the currently selected lighting level in the area.

2. Shade Control: Allows the user to use a web browser on their personal PC, laptop, or some mobile devices (supporting 1024 by 768 resolution) to control one or more shades in their area.

    a. The user may select open, closed, or a favorite shade position.
    b. The user may raise/lower a selected shade group in the area.

3. Supports up to 10,000 users.
4. Each user to have a login name and password sent from administrator via email when user account created.
5. Supported Browsers: Microsoft Internet Explorer (versions 7 and higher), Mozilla Firefox (versions 3 and higher), Apple Safari (versions 4 and higher), Google Chrome (versions 8 and higher).

2.11 CONTROL STATIONS

A. Provide control stations with configuration as indicated or as required to control the loads as indicated.

1. Wired Control Stations:

a. General Requirements:

2. Power: Class 2 (low voltage).
3. UL listed.
4. Provide faceplates with concealed mounting hardware.
5. Borders, logos, and graduations to use laser engraving or silkscreened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.
6. Finish: Custom colors to be selected by Architect.

B. Multi-Scene Wired Control:

1. General Requirements:

a. Allows control of any devices part of the lighting control system.
b. Allows for easy reprogramming without replacing unit.
c. Replacement of units does not require reprogramming.
d. Communications: Utilize RS485 wiring for low-voltage communication.
e. Engrave keypads with button, zone and scene description to be selected by Architect.
f. Software Configuration:

1) Customizable control station device button functionality:

a) Buttons shall be programmed to perform single defined action.
b) Buttons shall be programmed to perform defined action on press and defined action on release.
c) Buttons shall be programmed using conditional logic off of a state variable such as time of day or partition status.
d) Buttons shall be programmed to perform automatic sequence of defined actions.
e) Capable of deactivating select keypads to prevent accidental changes to light levels.
f) Buttons shall be programmed for raise/lower of defined loads.
g) Buttons shall be programmed to toggle defined set of loads on/off.

g. Status LEDs:

1) Upon button press, LEDs to immediately illuminate.
2) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.

3) Support logic that defines when LED is illuminated.

a) Scene logic (logic is true when all zones are at defined levels).
b) Room logic (logic is true when at least one zone is on).
c) Pathway logic (logic is true when at least one zone is on).
d) Last scene (logic is true when spaces are in defined scenes).

2. Wired Keypads:

a. Style: To be determined by the Architect and user.
b. Communications: Utilize RS485 wiring for low-voltage communications link.
c. Mounting: Wall box or low voltage mounting bracket; provide wall plates with concealed mounting hardware.
d. Button/Engraving Backlighting:

1) Utilize backlighting for buttons and associated engraving to provide readability under all light conditions.
2) Backlight intensity adjustable via programming software.

e. Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
f. Contact Closure Interface: Provide two contact closure inputs on back of unit which provide independent functions from front buttons; accepts both momentary and maintained contact closures.
g. Terminal block inputs to be over-voltage and miswire-protected against wire reversals and shorts.
h. Provide integral infrared receiver for personal control, to be determined.

C. Single-Scene or Zoned Wired Control:

1. Turn an individual fixture or group of fixtures on and off.
2. Raise and lower light levels.
3. Recall favorite light levels.

D. Four-Button Preset Wall station:

1. Recall four scenes plus all on or all off for one group of fixtures.
2. Master raise/lower control for entire group of fixtures.
3. Integral IR receiver for personal control.
4. Immediate local LED response upon button activation to indicate that a system command has been requested.

E. Wired Key switch:

1. Allows control of any devices part of the lighting control system.
2. Communications: Utilize RS485 wiring for low-voltage communications link.
3. Functionality:

    a. Allows for easy reprogramming without replacing unit.
    b. Requires key insertion to activate actions.

4. Engrave keypads with button, zone, and scene descriptions to be selected by Architect.

5. Software Configuration:

    a. Customizable control station device button functionality:

        1) Key positions shall be programmed to perform single defined action.
        2) Key positions shall be programmed using conditional logic off of a state variable such as time of day or partition status.

6. Single Touch Slider Control:

    a. Allows control of any single lighting zone in the system.
    b. Communications: Utilize RS485 wiring for low-voltage communications link.
    c. Switch Control: Single-touch LED bar for on/off operation.
    d. Dimmer Control: Single touch LED bar with one portion of bar for on/off operation and one portion for dimmer adjustment.

        1) Single touch of light level adjustment control portion of LED bar raises/lowers lights, with new level becoming the current preset level.
        2) When off, single touch of on/off control portion of LED bar raises lights to preset level.
        3) When on, single touch of on/off control portion of LED bar initiates long fade to off.
        4) Provides audible feedback for touch control confirmation.
        5) LED bar indicates on/off status and current light level, and functions as locator light when dimmer is off.
        6) Provides for customized adjustment of dimmer functions via programming software:

            a) High/low end trims.
            b) LED brightness.

c) Sound on/off.
d) Off fade time.
e) On fade time.
f) Present lock capability.

e. Infrared Handheld Controls:

1) Quantity: To be determined.
2) Designed for use in conjunction with compatible infrared receiver and lighting control; compatibility dependent on that receiver, not transmitter.
3) Learnable by other variable frequency remote controls.

2.12 LOW-VOLTAGE CONTROL INTERFACES

A. Provide low-voltage control interfaces as indicated or as required to control the loads as indicated.

B. Connects to lighting management hub via RS485.

C. UL listed.

D. Contact Closure Interface:

1. The contact closure input device to accept both momentary and maintained contact closures.
2. The contact closure output device shall be configured for maintained or pulsed outputs.
3. Contact closure shall be programmed using conditional logic off of a state variable such as time of day or partition status.

E. Wallbox Input Closure Interface:

1. Mounts in wall box behind contact closure keypad to provide interface for up to eight contact closure inputs.
2. The contact closure input device to accept both momentary and maintained contact closures.

F. RS232 and Ethernet Interface:

1. Provide ability to communicate via Ethernet or RS232 to audiovisual equipment, touchscreens, etc.
2. Allow creation of custom output strings.
3. Provide control of:

a. Light scene selections.

b. Fine-tuning of light scene levels with raise/lower.
c. Shade group presents.
d. Fine-tuning of shade preset levels with raise/lower.
e. Simulate system wall station button presses and releases.

4. Provide status monitoring of:

a. Light scene status.
b. Shade group status.
c. Wall station button presses and releases.
d. Wall station LEDs.

5. Provide ability to send custom output strings.

G. DMX Interface:

1. Provide ability to:

a. Map a single zone intensity to a single DMX512 lighting channel.
b. Map a single zone intensity to three DMX512 channels for RGB/CMY color control.
c. Map a single zone intensity to a single DMX512 integration channel.
d. Smoothly transition from one color to another in a cross fade.
e. Automatically sequence through a variety of colors.
f. Download, program, and customize a color wheel for each unit.

H. Sensor Modules:

1. Wired Modules:

a. Provide wired inputs for:

1) Occupancy sensors.
2) Daylight sensors.
3) IR receivers for personal control.
4) Digital ballast wall stations.

2. Communicate sensor information to wired low-voltage digital link for use by compatible devices.

2.13 SENSORS

A. Occupancy Sensors:

1. General Requirements:

a. Connects directly to compatible ballasts and modules without the need of a power pack or other interface.
b. Turns off or reduces lighting automatically after reasonable time delay when a room or area is vacated by the last person to occupy the space.
c. Accommodates all conditions of space utilization and all irregular work hours and habits.
d. Comply with UL 94.
e. Self-Adaptive Sensors: Continually adjusts sensitivity and timing to ensure optimal lighting control for any use of the space; furnished with field adjustable controls for time delay and sensitivity to override any adaptive features.
f. Provide capability to:

    1) Add additional timeout system-wide without need to make local adjustment on sensor.
    2) Group multiple sensors.

g. Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
h. Furnished with all necessary mounting hardware and instructions.
i. Class 2 devices.
j. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
k. Wall-Mounted Sensors: Provide swivel-mount base.
l. Color: White.

2. Passive Infrared Sensors:

    a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
    b. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.\

3. Ultrasonic Sensors:

    a. Utilize an operating frequency of 32 kHz or 40 kHz, crystal-controlled to operate within plus/minus 0.005 percent tolerance.

4. Dual Technology Sensors:

    a. Passive Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.

b. Ultrasonic: Utilize an operating frequency of 32 kHz or 40 kHz, crystal controlled to operate within plus/minus 0.005 percent tolerance.
c. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
d. Isolated Relay: Provide an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options where indicated.
e. Integral Photocell: Provide an integral photocell with adjustable sensitivity to prevent lights from turning on when there is sufficient natural light.

B. Sensor Power Packs:

1. Provide sensor power packs where required for power connection to sensors.
2. For ease of mounting, installation and future service, power pack(s) to be able to mount through a 1/2-inch knockout in a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Transformer to provide power to a minimum of three sensors when possible.
3. Plenum-rated is not acceptable; install within raceway.

C. Infrared Receivers:

1. Use Class 2 wiring for low voltage communication.
2. Shall be replaced without reprogramming.
3. 360-degree reception of wireless infrared remote controls.
4. Immediate local LED response upon reception of handheld transmitter communication.
5. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
6. Constructed via sonic welding.
7. Color: White.

D. Daylight Sensors:

1. Digital Interior Daylight Sensor:

a. Use Class 2 wiring for low voltage communication.
b. Shall be replaced without reprogramming.
c. Open-loop basis for daylight sensor control scheme.
d. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).

e. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
f. Provide linear response from 0 to 500 footcandles.
g. Integral IR receiver for personal control.
h. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
i. Constructed via sonic welding.
j. Color: White.

2. Daylight Control Package:

a. Controller:

1) Automatically switches a dry contact according to changes in ambient light levels.
2) Fully adjustable separate high and low setpoints, with an adjustable dead band between set points to prevent unwanted cycling.
3) Input time delay to prevent unwanted cycling due to intermittent light level fluctuations.
4) Signal/setpoint and relay status indication.
5) Sensor calibration input.

b. Sensors:

1) Class 2, three-wire analog devices.
2) Provision for zero or offset based signal.
3) Indoor Photo Sensor: With fresnel lens and 60-degree cone of response; sensor range of 0 to 750 footcandles.
4) Outdoor Photo Sensors: Weatherproof, with hood over aperture to shield sensor from direct sunlight; sensor range of 0 to 750 footcandles.
5) Atrium Photo Sensors: With translucent dome and 180-degree field of view; sensor range of 2 to 2,500 footcandles.
6) Skylight Photo Sensors: With translucent dome and 180-degree field of view; sensor range of 10 to 7,500 footcandles.

E. Infrared Partition Sensors:

1. Provide contact closure based on status of the partition wall (open/close) enabling automatic linking of controls.

2.14 ACCESSORIES

A. Emergency Lighting Interface:

1. Provides total system listing to UL 924 when used with lighting control system.
2. Senses all three phases of building power.
3. Provides an output to power panels or digital ballast interfaces if power on any phase fails and sends all lights controlled by these devices to <<an emergency light level setting; 100 percent intensity. Lights to return to their previous intensities when normal power is restored.
4. Accepts a contact closure input from a fire alarm control panel.

B. Provide power supplies as indicated or as required to power system devices and accessories.

2.15 SOURCE QUALITY CONTROL

A. Factory Testing:

1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.
2. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.
3. Perform factory audit burn-in of all dimming assemblies and panels at 104 degrees F (40 degrees C) at full load for two hours.
4. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

2.16 RELAY PANEL

A. Addressable relay panel that fully integrates with the addressable control system, consisting of individual relays, control module, power supplies, network connection interface, DIN rail supports and cabinet.

B. Cabinet: NEMA 1 enclosure sized to accept up to 24 relays. Enclosure shall be 19" high x 18” wide x 4” deep minimum.

C. Cover: Standard surface mount, hinged, lockable cover with windows for viewing relay status indicators. A wiring schedule directory card shall be affixed to the rear of the cover.

D. Interior: DIN rail supports for relays and circuit board back control module pre-wired to relays. Each relay shall be addressed as individual zone or as part of a larger zone and is controlled through the software.

E. Control relays: Heavy-duty momentary pulsed mechanically latching contactors. Operating voltage is 24VAC; contacts are rated at 20 amps at 120

or 277VAC. They shall attach to the interior DIN rail support and pre-wire to circuit board.

F. Control module: The control module is mounted in the center of the panel with 12 relays on either side and is wired to each individual relay. Each relay is addressable via the control module and shall be controlled independently via the system software.

G. Power supply: 120/277VAC input transformer with 24VAC, 60Hz, 1.6A (40VA) Class II power supplies output.

H. Network connection: Two RJ45 ports

2.17 DIMMING BALLAST

A. Refer to Specification Section 26 51 00 for dimming ballast requirements. Ensure that the selected dimming ballasts will integrate with the lighting control system.

2.18 OCCUPANCY SENSOR

A. General:

1. Occupancy sensors shall comply with the latest edition of the California Building Energy Efficiency Standards, California Building Code, Part 6 and be certified by The California Energy Commission. All sensors shall be listed in the most current directory of Certified Occupancy Sensing Devices or be on file with the CEC.
2. Occupancy sensors shall be dual-technology type infrared/ultrasonic.
3. All sensors shall have an adjustable time delay for turning off lights and a sensitivity adjustment.
4. Units shall be furnished to cover the areas being controlled. No allowance shall be given for providing sensors improperly sized for the square footage of the controlled area.

B. Color: Device color shall be white, unless otherwise noted.

C. Ceiling mounted single-directional sensors:

1. Sensor shall have a minimum coverage of up to 900 square feet.
2. Operation shall be automatic "ON" and automatic "OFF".
3. Time delay adjustment from 30 seconds to 30 minutes. Set adjustment at 10 minutes. Set sensitivity adjustment at maximum.
4. For use in small office areas.

D. Ceiling mounted omnidirectional sensors:

1. Sensor shall have a minimum coverage of up to 1000 square feet.
2. Operation shall be automatic "ON" and automatic "OFF".
3. Time delay adjustment from 30 seconds to 15 minutes. Set adjustment at 10 minutes. Set sensitivity adjustment at maximum.
4. For use in larger open office areas.

2.19 PHOTOCELL SENSOR

A. Interior day-light harvesting dimming control sensors:

1. General:

   a. Automatically dims 0–10VDC fluorescent dimming ballasts.
   b. Dimming sinks up to 20mA.
   c. Self-calibrating set-points.
   d. Digital set-point control.
   e. Push-button programmable.
   f. Green LED status indicator.
   g. 100-hour lamp burn-in timer mode.
   h. A sensor that measures ambient light in a finite area shall be available.
   i. Specifications: The sensor shall measure light from any source in the visible spectrum within at least a 60º cone. It shall measure light between 0 and minimum 75 foot-candles.

2. Species:

   a. Sensor shall measure light from any source in the visible spectrum within at least a 60º cone. As a minimum, it shall measure light between 0 and 75 footcandles.
   b. Sensor controls dimmable ballast to achieve maximum daylight harvesting while maintaining a minimum light level, which was programmed in as the set-point.
   c. When no light is available, the sensor will allow the dimmable ballast to operate at its full bright level (10 VDC). As daylight increases and begins to contribute to the overall light level of the room, the control system starts dimming the ballast proportionally. At the point when sufficient daylight is present to maintain the set-point without any contribution from the light fixtures, the sensor will hold the ballast at its full dim setting (0 VDC).
   d. When daylight levels fall below the set-point again, the control system will start reducing the dim level (increasing the brightness) in order to increase the overall light level.
   e. Finally, at the point when all daylight contribution is gone, the ballast will again be at its full bright level (10 VDC).

f. With dimming control sensors, the set-point shall be easily adjusted after it has been initially programmed using the control feature that steps the brightness setting (voltage) up or down 10% (1 VDC) and adjusts the setpoint accordingly.

3. Mounting: The sensor shall be flush mounted on or recessed inside ceiling tile.
4. Environmental Specifications:

a. Operating Temperature Range: -10ºC to 71ºC
b. Storage Temperature Range: -26ºC to 71ºC
c. Relative Humidity: 20% to 90% non-condensing.

B. Exterior “on/off” control sensors:

1. General:

a. Integrates photocell controller with outdoor mounted photocell sensor
b. Adjustable “on/off” set points.
c. Dual power unit input at 24VDC or 24VAC.
d. Flexible control options.
e. Input time delay.
f. Two set point available for separate “on” and “off” levels.

2. Specifics:

a. Controller:

1) Automatically switches a dry contact in response to changes in natural daylight.
2) Provides a maintained single-pole, double-throw Form C relay output to drive electrically held contactors or relays, or inputs to control system.
3) Continuously compares the remote sensor’s signal against the “low” and “high” level set points. When the sensor detects decreasing light levels that correspond with the “low” set point, the lights are switched “on.” Conversely, as light levels increase and the sensor’s signal matches the “high” set point, the lights are switched “off.”
4) The “low” and “high” set points are separated by a “deadband.” This prevents the controller from switching light levels between set points, thus eliminating nuisance or intermittent changes.

b. Sensor:

1) Outdoor application sensor with ability for adjusting sensitivity.

2) Maximum output voltage shall be matched to the maximum light level in order to provide the highest resolution signal.
3) Sensor is enclosed in a weatherproof housing with a visor for shading and lens protection.

3. Operating Specifications:

a. Accuracy: +/-1% at 21ºC, derated +/-5% above 49ºC and below -18ºC
b. Operating Temperature Range: -11ºC to 60ºC
c. Input voltage: 24VDC or 24VAC
d. Output relay: Standard Form C SPDT, 10A resistive
e. Sensor type: Blue-enhanced photo diode
f. Sensor range: 5 to 750 footcandles

2.20 BACNET INTERFACE

A. BACnet interface module:

1. Enables the integration of the control system with any BACnet compatible building automation system. The control system operates autonomously while lighting status, lighting levels and energy usage are all shared and possible controlled via BACnet. Connection between the two systems is established via BACnet/IP.
2. Enables BACnet switching and dimming control.
3. Provides load shedding control over the lighting system.
4. Shares occupancy sensor information obtained by the control system with a BACnet client for HVAC system integration.
5. Utilizes a centralized BACnet time schedule.

B. The BACnet interface module creates access points with names and descriptions that shall be customized to accommodate any client's naming scheme. It also exports standard BACnet object properties in a clear, structured manner and can define an unlimited number of groups of lighting fixtures.

C. The control system BACnet interface module shall adhere to ANSI/ASHRAE Standard 135-2004 "BACnet" (ISSN 1041-2336).

2.21 NETWORK COMMUNICATION CABLING

A. General:

1. The network communication technology is a bus configured system design, using RS485, which allows for communication and control of the lighting system on the network.
2. The network communication cabling integrates peripheral devices such as occupancy sensors, photocell sensors, relay-based controls, switch packs and low-voltage wall controls onto a complete, programmable lighting control system.
3. The network communication cabling provides low-voltage power to all devices on the network, eliminating the need for external power supplies and power packs for devices such as occupancy sensors.
4. Daisy-chain wiring topologies allows for ease in installation.

B. Electrical:

1. Cable:
   a. Cable shall meet CAT6 performance criteria & routed in raceway(s); plenum rated and is NOT acceptable & cable shall not be run exposed in accessible ceilings or cable trays.
   b. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a nit with individually color-coded pairs to conform to industry standards (ANSI/ICEA Publication S-80-576-1994 and EIA-230).
   c. Flame rating: CMP according to NEC Article 800, tested to NFPA 262 and UL Listed as such.
2. Connectors:

   a. Modular connectors shall be 8-position jacks, compliant to TIA/EIA-568-B.2 Addendum 10 and shall be compatible with the specified cable within this Section, both electrically and physically.
   b. Modular connectors shall be RJ45 and T568A wired.

3. Power supply: Up to 24VDC for sensors.

C. Characteristics:

1. Maximum number of devices per channel: 75
2. Maximum number of channels per ECU: 6
3. Maximum channel length: 2,500 ft.
4. Available pre-terminated lengths: 5 ft, 10 ft, 15 ft, 20 ft, 25 ft & 50 ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall thoroughly examine Project site conditions for acceptance of low voltage lighting control installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

B. Verify that field measurements are as shown on the drawings.

C. Verify that ratings and configurations of system components are consistent with the indicated requirements.

D. Verify that mounting surfaces are ready to receive system components.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Install the network lighting control system in accordance with the Manufacturer's written instructions, as indicated on the shop drawings and as specified herein.

C. Provide all devices as required for a complete, functional lighting control system. Not all devices are necessarily indicated on the plans. Install all control devices in accordance with the Manufacturer's wiring diagrams.

D. Run all control cables in conduit within walls and in areas where ceiling is exposed to structure. Network cabling may be routed exposed above accessible ceiling or with telecommunications cabling in cable tray above accessible ceilings, where applicable.

E. Lighting control cables shall be of a different color and bundled separately from telecommunications cabling and other low voltage wires. Coordinate with the Telecommunications plans.

F. Provide dedicated network between lighting management system computer and lighting management hubs.

G. Define each dimmer/relay load type, assign each load to a zone, and set control functions. Sensor Locations:

1. Locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

H. Locate wall sensors and control switches as indicated on the plans. Refer to Architectural elevations.

I. Mount exterior daylight sensors to point due north with constant view of daylight.

J. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

K. Automated Shade Control Sensors:

1. Mount rooftop cloudy day sensors to point in the direction of each facade.
2. Ensure that window shadow sensor placement provides an unobstructed view of outdoors. Do not place at a skylight or above indirect luminaires.

L. LED Light Engine/Array Lead Length: Do not exceed 100 feet (31 m).

M. System and Network Integration Consultation; The Lighting Control Manufacturer shall conduct a meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.

1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.3 DEVICE PARAMETERS

A. Refer to the lighting control matrix for device parameters, i.e. occupancy sensor time delay, daylight sensor set-point.

3.4 PROGRAMMING

A. Programming of the addressable lighting control system shall be by a factory authorized agent of the Manufacturer of the system. All programming, testing, trouble shooting, etc. shall be included in this contract.

3.5 FIELD QUALITY CONTROL

A. Refer to Specification Section 26 08 00: Electrical Commissioning.

B. Pre-functional Resting:

1. Visual and mechanical inspection:

   a. Inspect for physical damage, defects alignment and fit.
   b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
   c. Compare nameplate information and connections to Contract Documents.
   d. Check tightness of all control and power connections.
   e. Check that all covers, barriers and doors are secure.

2. Contractor shall provide all necessary programming assistance to set up and program the low-voltage lighting control equipment.

C. Manufacturer's field service: Contractor shall arrange and pay for the services of a factory-authorized service representative to supervise the initial start-up, pretesting and adjustment of the low-voltage lighting control system.

1. At least three weeks prior to any testing, notify the Engineer so that arrangement shall be made for witnessing test, if deemed necessary. All pretesting shall have been tested satisfactorily prior to the Engineer's witnessed test.
2. Manufacturer's authorized Service Representative to conduct minimum of two site visits to ensure proper system installation and operation.
3. Conduct Pre-Installation visit to review requirements with installer as specified in Part 1 under "Administrative Requirements".
4. Conduct second site visit upon completion of lighting control system to perform system startup and verify proper operation:

   a. Lighting Control Manufacturer authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
   b. Verify connection of power wiring and load circuits.
   c. Verify connection and location of controls.
   d. Energize lighting management hubs and download system data program.
   e. Address devices.
   f. Verify proper connection of panel links (low voltage/data) and address panel.
   g. Download system panel data to dimming/switching panels.

h. Check dimming panel load types and currents and supervise removal of bypass jumpers.
i. Verify system operation control by control.
j. Verify proper operation of manufacturer's interfacing equipment.
k. Verify proper operation of manufacturer's supplied PC and installed programs.
l. Configure initial groupings of ballast for wall controls, daylight sensors and occupancy sensors.
m. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM – GENERAL REQUIREMENTS".
n. Train Owner's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".
o. Obtain sign-off on system functions.

5. Electrical Tests:

a. The system shall be completely tested in accordance with operational parameters, tolerances and Manufacturer's instructions. Any problem shall be documented and corrected.
b. Test all control circuits and verify proper operation of all lighting circuits throughout the control system.
c. Ensure the lighting zone controls match that of the Contract Documents.
d. Verify the proper integration with the mechanical control system for override control and monitoring of low-voltage lighting control system.
e. Provide a complete report listing every device, the date it was tested, the results and the date retested (if failure occurred during the previous test). The test report shall indicate that every device tested successfully.

D. Functional Performance Testing: Refer to Specification Section 260800: Electrical Commissioning for requirements of system wide functional performance testing.

E. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances. Contractor shall have the opportunity to rectify any issues prior to the Owner requesting replacement.

F. Contractor shall submit the testing final report for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test

dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.

3.6 ADJUSTING

A. On-Site Scene and Level Tuning: The Lighting Control Manufacturer shall visit site to conduct meeting with Owner's representative to make required lighting adjustments to the system for conformance with original design intent.

B. Sensor Fine-Tuning: The Lighting Control Manufacturer shall provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration.

3.7 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.8 COMMISSIONING

A. See Section 26 08 00 for commissioning requirements.

B. Title 24 Acceptance Testing Service: The Lighting Control Manufacturer shall perform lighting control acceptance testing in accordance with CAL TITLE 24 P6. Submit required documentation.

3.9 CLOSEOUT ACTIVITIES

A. Demonstration:

1. On-Site Performance-Verification Walkthrough: The lighting control manufacturer shall provide on-site demonstration of system functionality to <<commissioning agent and the owner’s representative.

B. Training:

1. Include services of manufacturer's authorized Service Representative to perform a one day (8 hour) on-site training session for Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of standard system start-up services.

   a. Include training on software to be provided:

      1) Configuration software used to make system programming and configuration changes.

2) Control and monitor.
3) Energy savings display software.
4) Personal web-based control software.

3.10 PROTECTION

A. Protect installed products from subsequent construction operations.

3.11 MAINTENANCE

A. Software Maintenance Agreement: The manufacturer shall provide quarterly compatibility testing results for PC-based lighting control software and new patches issued for Microsoft Operating System, Database, and Browser tools.

1. If new Microsoft patches create a software conflict, manufacturer to provide lighting control software patches to ensure continued operation.

B. System Optimization Visit: The Lighting Control System Manufacturer shall visit the site six months after system start-up to evaluate system usage and discuss opportunities to make efficiency improvements that will fit with the current use of the facility.

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SECTION 26 13 13

MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes main and distribution switchboards.

B. Related Sections:

1. Section 26 0526 - Grounding and Bonding for Electrical Systems.
2. Section 26 0553 - Identification for Electrical Systems.
3. Section 26 2813 – Fuses.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.
2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

B. Institute of Electrical and Electronics Engineers:

1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3. NEMA PB 2 - Deadfront Distribution Switchboards.
4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

E. Underwriters Laboratories Inc.:

1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
2. UL 891 - Dead-Front Switchboards.

1.3 SUBMITTALS

A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, [neutral,] and ground; and switchboard instrument details.

B. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

C. Test Reports: Indicate results of factory production and field tests.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.

B. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section .

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept switchboards on site. Inspect for damage.

B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 SEQUENCING

A. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Cutler-Hammer/Eaton.
2. GE Electrical & Distribution.
3. Siemens.
4. Square-D.
5. Or approved equal.

2.2 DISTRIBUTION SWITCHBOARDS

A. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

B. Device Mounting: as indicated on drawings.

C. Front-Connected, Front-Accessible Switchboard: As specified in drawings.

D. Nominal System Voltage: As specified in drawings.

E. Main-Bus Continuous: As specified in drawings.

F. Enclosure: Steel, NEMA 250, Type 1 or 3R.

G. Enclosure Finish: Factory-applied finish in manufacturer's standard gray finish.

H. Barriers: Between adjacent switchboard sections.

I. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

J. Buses and Connections: Three phase, four wire, unless otherwise indicated tin-plated aluminum of 98 percent conductivity with feeder circuit-breaker line connections.
   1. Ground Bus: 1/4 by 2 inch (6 by 50 mm) minimum-size, tin-plated aluminum, equipped with pressure connectors for feeder and branch-circuit ground conductors. For bus-way feeders, extend insulated
   2. equipment grounding cable to bus-way ground connection and support cable at intervals in vertical run.
   3. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections.
   4. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
   5. Neutral Buses: 50 percent of the ampacity of phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for bus-way feeder neutral bus are braced.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 225 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic Trip-Unit (ETU) circuit breakers shall have RMS sensing, field-replaceable rating plug, and the following field-adjustable settings:

      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I2t response. Where required by code.
         1) GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.

      e. The 250A and 400A frame breakers with ETU shall be used for all emergency circuits smaller than 250A or 400A trip ratings that require selective coordinate per CEC.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles. Where requested on plans.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 or 75 percent of rated voltage.
5. Under-voltage Trip: Set to operate at 35 to 75 percent of rated voltage time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

C. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments with I2t response.
   d. Ground-fault pickup level, time delay, and I2t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Control Voltage: 125-V.

2.4 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Product Description: IEEE C62.41, factory-mounted transient voltage surge suppressor, selected to meet requirements for high exposure and to coordinate with system circuit voltage.

2.5 AMMETERS, VOLTMETERS and POWER METERS

A. Provide GE PQMII digital multi meter.

2.6 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surface is suitable for switchboard installation.

3.2 INSTALLATION

A. Install in accordance with NEMA PB 2.1. and NECA 40.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install fuses in each switch and coordinate sizes with connected load.

D. Install engraved plastic nameplates in accordance with Section 26 05 53.

E. Install breaker circuit directory.

F. Ground and bond switchboards in accordance with Section 26 05 26.

G. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.4 ADJUSTING

A. Adjust operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections.

C. Adjust breaker settings as required per results of coordination study.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

****

SECTION 26 13 16

MEDIUM-VOLTAGE FUSIBLE INTERRUPTER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of medium-voltage fusible interrupter switches, indicated as switches in this section.

1.2 RELATED WORK

A. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL: Requirements that apply to all sections of Division 26.

B. Section 26 0513, MEDIUM-VOLTAGE CABLES: Medium-voltage cables and terminations.

C. Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.

D. Section 26 0573, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Short circuit and coordination study, and requirements for a coordinated electrical system.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.

1.4 FACTORY TESTS

A. Factory Tests shall be required.

B. Factory Tests shall be in accordance with Paragraph, MANUFACTURED PRODUCTS in Section 26 05 00, COMMON WORK RESULTS FOR ELECTRICAL, and the following requirements:

1. Switches shall be tested to assure that there are no electrical or mechanical defects. Tests shall be conducted as per UL and ANSI Standards. Factory tests shall be certified. The following tests shall be performed:

    a. Verify that fuse sizes and types are in accordance with drawings and Overcurrent Protective Device Coordination Study.
    b. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
    c. Verify operation of mechanical interlocks.
    d. Confirm correct operation and sequencing of key-type mechanical interlock systems for multiple switches by attempting closure on locked-open devices, and attempting to open locked-closed devices, and making key exchange with devices operated in off-normal positions.
    e. Verify correct phase barrier installation.
    f. Verify correct operation of all indicating and control devices.
    g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    h. Exercise all active components.
    i. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.

1.5 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, and the following requirements:

1. Shop Drawings:

    a. Shop drawings shall be submitted simultaneously with or after the Overcurrent Protective Device Coordination Study.
    b. Submit sufficient information to demonstrate compliance with drawings and specifications.
    c. Provide information such as complete electrical ratings, dimensions and approximate design weights, enclosure types, mounting details, materials, required clearances, cable terminations, fuse sizes and class, interrupting ratings, wiring diagrams, front, side and rear elevations, sectional views, safety features, accessories, and nameplate data.
    d. Certification from the manufacturer that representative switches have been seismically tested to CBC requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.

2. Manuals:

   a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering replacement parts.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certification: Two weeks prior to the final inspection, submit the following.

   a. Certification by the manufacturer that switches conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that switches have been properly installed, adjusted, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American National Standards Institute (ANSI):

C37.57-10 .....Metal-Enclosed Interrupter Switchgear Assemblies - Conformance Testing

C37.58-20 .....Indoor AC Medium-Voltage Switches for Use in Metal-Enclosed Switchgear - Conformance Test Procedures

C. International Code Council (ICC):

IBC-21.....International Building Code

D. Institute of Electrical and Electronics Engineers (IEEE):

C37.20.3-13 .....Metal-Enclosed Interrupter Switchgear (1kV – 38kV)

C37.22-03 .....Preferred Ratings and Related Required Capabilities for Indoor AC Medium Voltage Switches Used in Metal-Enclosed Switchgear

C37.42-16 .....Specifications for High Voltage (>1000 V)Fuses and Accessories

C37.48-20 .....Guide for Application, Operation and Maintenance of High Voltage Fuses, Distribution Enclosed Single

Pole Air Switches, Fuse Disconnecting Switches, and Accessories

E. National Fire Protection Association (NFPA):

70-23.....National Electrical Code (NEC)

PART 2 - PRODUCTS

2.1 MEDIUM-VOLTAGE FUSIBLE INTERRUPTER SWITCHES

A. Shall be in accordance with ANSI, IEEE, NFPA, as shown on the drawings, and have the following features:

1. Deadfront air break, three-pole gang-operated, interrupter type.
2. Copper blades.
3. Key-type mechanical interlocks for multiple switches shall be provided as shown on the drawings.
4. Interphase barriers for the full length of each pole.
5. Protective shield to cover the cable connections on the line terminals.
6. Quick-make, quick-break, manual stored-energy type operation mechanism. The mechanism shall enable the switch to close against a fault equal to the momentary rating of the switch without affecting its continuous current carrying or load interrupting ability.
7. External manual operating handle with lock-open padlocking provisions.
8. When the switches are open, the fuses shall be de-energized.
9. Current limiting fuses.
10. Expulsion fuses.
11. Enclosures:

    a. NEMA type shown on the drawings. Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.
    b. Doors:

        1) Concealed or semi-concealed hinges shall be used to attach doors. Weld hinges to the enclosure and door.
        2) A separate door for the fuse section. A mechanical interlock shall prevent opening the door unless the switch blades are open, and prevent closing the switch if the door is open.
        3) Three-point door locking mechanism with suitable handles and padlocking provisions.
        4) Safety-glass window for viewing the switch blades.
        5) Door stops for the open position.

c. Finish:

1) All metal surfaces shall be thoroughly cleaned, phosphatized, primed and painted at the factory.
2) Final finish shall be enamel, lacquer or powder coating. Enamel and powder coatings shall be oven baked. Color shall be light gray.

B. The minimum momentary current rating shall be 40 kA.

C. The minimum short-time 2-second current rating shall be 25 kA.

D. Provide full-length ground bar.

2.2 NAMEPLATES

A. Nameplates: For Normal Power system, provide laminated black phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each switch. For Essential Electrical System, provide laminated red phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each switch. Nameplates shall indicate equipment served, spaces, or spares in accordance with one line diagram shown on drawings. Nameplates shall be mounted with plated screws on front of switches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the CEC, as shown on the drawings, and manufacturer's instructions.

B. Anchor switches with rustproof bolts, nuts, and washers not less than 13 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.

C. In seismic areas, switches shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.

D. Exterior Location: Mount switches on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade

shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

E. Interior Location: Mount switches on concrete slab. Unless otherwise indicated, the slab shall be at least 100 mm (4 inches) thick. The top of the concrete slab shall be approximately 100 mm (4 inches) above finished floor. Edges above floor shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 100 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:

1. Visual Inspection and Tests:

   a. Compare switches nameplate data with specifications and approved shop drawings.
   b. Inspect physical and mechanical condition.
   c. Confirm correct application of manufacturer's recommended lubricants.
   d. Vacuum-clean switch enclosure interior. Clean switch enclosure exterior.
   e. Verify appropriate anchorage and required area clearances.
   f. Verify appropriate equipment grounding.
   g. Verify correct blade alignment, blade penetration, travel stops, and mechanical operation.
   h. Verify that fuse sizes and types correspond to approved shop drawings.
   i. Inspect all field-installed bolted electrical connections, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization under load.
   j. Exercise all active components.
   k. Confirm correct operation of mechanical interlocks.

l. Confirm correct operation and sequencing of key-type mechanical interlocks for multiple switches.
m. Inspect all indicating devices for correct operation.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that switches are in good operating condition, and properly performing the intended function.

3.4 SPARE PARTS

A. Two weeks prior to the final inspection, provide one (1) set of spare fuses for each switch installed on this project.

3.5 ONE LINE DIAGRAM AND SEQUENCE OF OPERATION

A. At final inspection, an as-built one line diagram shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.

B. Furnish a written sequence of operation for the switchgear and connected line side/load side electrical distribution equipment. The sequence of operation shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.

3.6 INSTRUCTION

A. Furnish the services of a factory-trained technician for one 4-hour period for instructing personnel in the operation and maintenance of the switches and related equipment.

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SECTION 26 23 00

LOW VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of low-voltage switchgear, indicated as switchgear in this section.

1.2 RELATED WORK

A. Section 03 3000, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.

B. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL: Requirements that apply to all sections of Division 26.

C. Section 26 0519, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

D. Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible fault currents.

E. Section 26 0533, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

F. Section 26 0573, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Short circuit and coordination study, and requirements for a coordinated electrical system.

G. Section 26 1116, SECONDARY UNIT SUBSTATIONS: Secondary unit substations.

H. Section 26 2511, BUSWAYS: Feeder busways and fittings.

I. Section 26 4313, SURGE PROTECTIVE DEVICES: For surge protective devices integral to the switchgear.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.

1.4 FACTORY TESTS

A. Factory Tests shall be required.

B. Factory Tests shall be in accordance with Paragraph, MANUFACTURED PRODUCTS in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, and the following requirements:

C. Switchgear shall be tested, with the circuit breakers in the connected position in their compartments. Tests shall be in accordance with IEEE C37.20.1 and NEMA C37.51. Factory tests shall be certified, and shall include the following tests:

1. Design tests.
2. Production tests.
3. Conformance tests.

D. The following additional tests shall be performed:

1. Verify that circuit breaker sizes and types correspond to drawings, and the Overcurrent Protective Device Coordination Study.
2. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
3. Confirm correct operation and sequencing of key-type mechanical interlock systems for multiple circuit breakers by attempting closure on locked-open devices, and attempting to open locked-closed devices, and making key exchange with devices operated in off-normal positions.
4. Verify correct barrier and shutter installation and operation.
5. Exercise all active components.
6. Inspect indicating devices for correct operation.
7. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.
8. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 V DC for 300-volt rated cable and 1000 V DC for 600-volt rated cable, or as required if solid-state components or control devices cannot tolerate the applied voltage.
9. If applicable, verify correct function of control transfer relays located in the switchgear with multiple control power sources.

10. Perform phasing checks on double-ended or dual-source switchgear to insure correct bus phasing from each source.

1.5 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:

1. Shop Drawings:

   a. Switchgear shop drawings shall be submitted simultaneously with or after the Overcurrent Protective Device Coordination Study.
   b. Submit sufficient information to demonstrate compliance with drawings and specifications.
   c. Prior to fabrication of switchgear, submit the following data for approval:

      1) Complete electrical ratings.
      2) Circuit breaker sizes.
      3) Interrupting ratings.
      4) Safety features.
      5) Accessories and nameplate data.
      6) Switchgear one line diagram, showing ampere rating, number of bars per phase and neutral in each bus run (horizontal and vertical), bus spacing, equipment ground bus, and bus material.
      7) Elementary and interconnection wiring diagrams.
      8) Technical data for each component.
      9) Dimensioned exterior views of the switchgear.
      10) Dimensioned section views of the switchgear.
      11) Floor plan of the switchgear.
      12) Foundation plan for the switchgear.
      13) Provisions and required locations for external conduit and wiring entrances.
      14) Approximate design weights.

   d. Certification from the manufacturer that representative switchgear has been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.

2. Manuals:

   a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical

data sheets, wiring diagrams, and information for ordering replacement parts.

1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the switchgear.
2) Include information for testing, repair, trouble shooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
3) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.

b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

3. Certifications: Two weeks prior to final inspection, submit the following
.

a. Certification by the manufacturer that switchgear conforms to the requirements of the drawings and specifications.
b. Certification by the Contractor that switchgear has been properly installed, adjusted, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata), form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

B. Institute of Engineering and Electronic Engineers (IEEE):

C37.13-15	Low-voltage AC Power Circuit Breakers Used in Enclosures
C37.20.1-15	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
C57.13-16	Instrument Transformers
C62.41.1-08	Surge Environment in Low-voltage (1000V or less) AC Power Circuits
C62.45-92	Surge Testing for Equipment connected to Low-Voltage AC Power Circuits

C. International Code Council (ICC):

IBC-15	International Building Code

D. National Electrical Manufacturers Association (NEMA):

C37.51-03	Metal-Enclosed Low Voltage AC Power Circuit Breaker Switchgear Assemblies — Conformance Test Procedures
C37.51A-10	Metal-Enclosed Low Voltage AC Power Circuit Breaker Switchgear Assemblies — Conformance Test Procedures Amendment 1 Short-Time Withstand Current Tests

E. National Fire Protection Association (NFPA):

70-17	National Electrical Code (NEC).

F. Underwriters Laboratories, Inc. (UL):

891-05	Switchboards
977-12	Safety Fused Power-Circuit Devices
1053-15	Ground Fault Sensing and Relaying Equipment
1558-99	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

PART 2 - PRODUCTS

2.1 GENERAL

A. Shall be in accordance with IEEE, NEMA, NFPA, UL, as shown on the drawings, and have the following features:

1. Switchgear shall be a complete, grounded, continuous-duty, integral assembly, metal clad, dead-front, dead-rear, self-supporting, indoor type switchgear assembly, tamperproof, weatherproof, outdoor type switchgear assembly with metal housing and a walk-in protected aisle. Incorporate devices shown on the drawings and all related components required to fulfill operational and functional requirements.
2. Switchgear shall be Type 1 front accessible Type 2 front, side, and rear accessible.
3. Ratings shall not be less than shown on the drawings. Short circuit ratings shall not be less than 100kA.
4. Switchgear shall conform to the arrangements and details shown on the drawings.

5. Coordinate all requirements with the electric utility company supplying electrical service to the switchgear. The incoming electric utility feeder and revenue metering installation shall conform to the requirements of the electric utility company.
6. Key-type mechanical interlocks for multiple circuit breakers shall be provided as shown on the drawings.
7. Switchgear shall be assembled, connected, and wired at the factory so that only external circuit connections are required at the construction site. Split the structure only as required for shipping and installation. Packaging shall provide adequate protection against rough handling during shipment.
8. All non-current-carrying parts shall be grounded per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS for additional requirements.

2.2 HOUSING

A. Shall have the following features:

1. Frames and enclosures:

   a. The assembly shall be braced with reinforcing gussets using bolted connections/jig welds/ to assure rectangular rigidity.
   b. The enclosure shall be steel, leveled, and not less than the gauge required by applicable publications.
   c. Die-pierce the holes for connecting adjacent structures to insure proper alignment, and to allow for future additions.
   d. All bolts, nuts, and washers shall be zinc-plated cadmium-plated steel.

2. Circuit breaker compartments:

   a. An individual compartment shall be supplied for each circuit breaker and each future circuit breaker as shown on the drawings. Compartments shall be provided with isolated wireways for control wiring between devices.

      1) Separate each compartment so that the circuit breaker, buses, and cable terminations are in separate compartments with steel partitions or barriers of approved and properly installed insulation.
      2) Each compartment furnished with a circuit breaker (active or spare) shall be fully equipped as noted on drawings and specified below.
      3) Each compartment noted as space for future circuit breaker, as shown on drawings, shall be fully equipped for positioning and

connecting the breaker. Provide all equipment required to implement the future breaker installation.

3. Auxiliary compartments:

    a. Compartments shall be provided for auxiliaries, metering, and transition or termination sections as required by the manufacturer, and as shown on drawings. Compartments shall be provided with isolated wireways for control wiring between devices.

4. Compartment doors:
    a. The doors shall permit convenient removal and interchanging of circuit breakers between compartments. The doors shall be capable of a swing approaching 180 degrees.
    b. Concealed or semi-concealed hinges shall be provided to attach the doors. Weld the hinges to the equipment structure and to the compartment doors.

B. Walk-in Protected Enclosure:

1. Where indicated on the drawings, provide an outdoor, weatherproof, protected walk-in aisle enclosure, fabricated and coordinated with the switchgear to form an integral enclosure. Enclosure shall be seismically rated for the seismic zone in which it is installed.
2. Adequate space shall be provided for convenient installation, operation and maintenance of the circuit breakers, batteries, battery charger, circuit breaker test equipment, and the auxiliaries. The aisle area shall be not less than shown on the drawings.
3. The entire space within the enclosure shall be provided with a steel floor adequately reinforced to allow the circuit breakers to be interchanged and serviced without causing the floor to deflect. The entire floor shall be at the same level.
4. The roof of the enclosure shall slope to allow for adequate run-off of moisture.
5. The entire area between the floor and foundation, including feeder conduits, shall be enclosed by structural steel or steel sheets.
6. The enclosure shall include proper air conditioning, heating, and/or ventilation equipment as shown on the drawings or as recommended by the manufacturer. All ventilation openings shall be provided with suitable filters and rodent screens. The air conditioning and ventilation equipment shall limit the temperature rise to 6 degrees C (10 degrees F) above ambient, but no higher than 40 degree C (104 degrees F).
7. Provide wind-driven rain and wind-driven missile impact protection suitable for hurricane-prone regions.
8. Enclosure doors:

    a. Locate a door at each end of the protected aisle.

b. The doors shall be safety type, steel with concealed or semi-concealed hinges for attachment. Weld the hinges to the equipment structure.
c. Provide the doors with panic hardware on the inside and grab handle on the exterior. A latch bolt controlled by a key cylinder shall lock the door from the outside. Key the cylinder as directed by the HUCLA Medical Center and as coordinated with the electric utility company, if applicable.

9. Equipment rear doors:

a. Provide suitable weatherproof type doors on the rear of the switchgear enclosure for each compartment. Attach the doors by concealed or semi-concealed hinges. Weld the hinges to the enclosure and to the compartment doors. Provide each door with a three-point latching and locking assembly and provisions for padlocking.
b. The doors shall be capable of a swing approaching 180 degrees and shall be provided with intermediate doorstops.

10. Compartment heaters:

a. Install a thermostatically controlled electric strip heater within each circuit breaker compartment and cable termination compartment to limit excessive humidity during adverse weather conditions. Thermostat shall be set and marked with manufacturer's recommended setting.
b. Heater and associated control wiring shall be pre-wired at the factory. Properly fuse the wiring and protect to prevent terminal overheating.

11. Lighting:

a. Provide 1200 mm (4 feet), LED, ceiling mounted, 2400 mm (8 feet) on centers over the front aisle, with fixtures parallel to the switchgear. LED driver shall comply with Section 26 51 00, INTERIOR LIGHTING. Connect unswitched circuit to emergency battery packs of the fixtures, and switched circuit to fixture LED driver.
b. Fixtures shall be securely mounted (chains or wires are not allowed) and include wire guards to protect lamps in each fixture.
c. Install a 3-way switch at each enclosure entrance to control the lighting.

12. Receptacles: Provide one 2P, 3W, 20-amp heavy-duty duplex ground fault current interrupter (GFI) receptacle for each three compartments or fraction thereof. Space receptacles equidistant along the interior wall of the aisle space. Install a separate 20-amp circuit for every three (3) receptacles.

13. All branch circuit wiring shall be installed in conduit and shall be not less than No. 12 AWG.

C. Finish:

1. All metal surfaces shall be thoroughly cleaned, phosphatized and factory primed prior to applying baked enamel or lacquer finish.
2. Provide a light gray finish for indoor switchgear.
3. Outdoor switchgear:

   a. Interior finish shall be light gray.
   b. Exterior finishes shall be as specified in the Section 09 06 00, SCHEDULE FOR FINISHES.
   c. The underside of the switchgear and enclosure shall be treated with corrosion resistant compounds, epoxy resin or rubberized sealing compound.

2.3 BUSES

A. Bus Bars and Interconnections:

1. Provide copper phase and neutral buses, fully rated for the amperage as shown on the drawings for the entire length of the switchgear. Bus laminations shall have a minimum of 6 mm (1/4 inch) spacing.
2. Mount the buses on appropriately spaced insulators and brace to withstand the available short circuit currents.
3. The bus and bus compartment shall be designed so that the acceptable NEMA standard temperature rises are not exceeded.
4. Install a copper ground bus the full length of the switchgear assembly.
5. Main Bonding Jumper: An un-insulated copper bus, size as shown on drawings, shall interconnect the neutral and ground buses, when the switchgear is used to establish the system common ground point.
6. All bolts, nuts, and washers shall be zinc-plated/cadmium-plated/steel. Bolts shall be torqued to the values recommended by the manufacturer.
7. Make provisions for future bus extensions by means of bolt holes or other approved method.

2.4 LOW-VOLTAGE POWER CIRCUIT BREAKERS

A. General: Circuit breakers shall be dead front, drawout, stored energy type with solid state trip devices. Arcing contacts shall be renewable.

B. Rating: Circuit breakers shall be 3 pole, 600 volts AC and below, 60 cycle with frame size, trip rating and functions, and system voltage as shown on drawings. Breakers shall have 30 cycle short time current ratings.

C. Drawout Mounting: Provide a racking mechanism to position and hold the breaker in the connected, test, or disconnected position. Provide an interlock to prevent movement of the breaker into or out of the connected position unless the breaker is tripped open.

D. Trip Devices: Breakers shall be electrically and mechanically trip free and shall have trip devices in each pole. Unless otherwise indicated on drawings, each breaker shall have overcurrent and short-circuit, and integral ground fault trip devices. Trip devices shall be of the solid state type with adjustable pick-up settings, with both long time and short time elements, and integral trip unit testing provisions. Devices shall have time-delay band adjustment. Long-time delay element shall have inverse time characteristics. Main circuit breakers shall not have instantaneous trip function.

E. Position Indicator: Provide a mechanical indicator visible from the front of the unit to indicate whether the breaker is open or closed.

F. Trip Button: Equip each breaker with a mechanical trip button accessible from the front of the door.

G. Padlocking: Provisions shall be included for padlocking the breaker in the open position.

H. Operation: Unless otherwise indicated herein or on the drawings, breakers 1600 ampere frame size and less shall be manually operated. Breakers larger than 1600 ampere frame size shall be electrically operated.

2.5 BATTERY SYSTEM

A. Batteries:

1. Provide high discharge rate type maintenance-free nickel-cadmium batteries. Battery voltage shall be 48 volts nominal. Calculate the battery capacity based on the lowest ambient temperature in the room where it is to be installed. Include a safety margin of 50 percent for reserve capacity.

   a. Provide sufficient battery capacity to carry all continuous loads (lamps, relays, etc.) for 8 hours and then perform the greater of the following duties, with the charger de-energized.

      1) Trip all circuit breakers simultaneously or,
      2) Close the largest breaker in a line-up of four or less breakers, or close the two largest breakers simultaneously in a line-up of more than four breakers. Breaker closing current shall include both the spring release coil current and the starting current of the spring charging motor.

2. Provide battery connector covers for protection against external short circuits.
3. Provide corrosion-resistant steel battery racks.
4. In seismic areas, batteries shall be secured to the battery rack to prevent overturning during a seismic event. Battery rack shall also be secured to the floor.
5. The battery system shall be certified under the HCAI OSP Program.

B. Battery Charger:

1. Provide a charger of the full wave rectifier type utilizing silicon controlled rectifiers as the power-control elements. Construction shall be modular with plug-in control units for easy replacement.
2. The charger shall maintain 1/2 of one percent voltage regulation from no load to full load for line voltage variation of 10 percent, and frequency variation of 3 Hz from 60 Hz.
3. The charger shall maintain a nominal float voltage of 1.4 vpc, and a nominal equalizing voltage of 1.5 vpc.
4. The charger shall be capable of continuous operation in an ambient temperature of 40 degrees C (104 degrees F) without derating. The charger shall be installed in a convection cooled NEMA Type 1 ventilated enclosure. The housing is to have a hinged front door with all equipment accessible from the front.
5. Provide both AC and DC transient protection. Charger shall be able to recharge a fully discharged battery without tripping AC protective devices. AC circuit breaker shall not trip under any DC load condition, including short circuit on output terminals.
6. The charger shall be capable of supplying the following demand simultaneously:

    a. Recharging a fully discharged battery in 12 hours.
    b. Supervisory panel and control panel.
    c. Steady loads (indicating lamps, relays, etc.).

7. The charger shall have fused AC input and DC output protection.
8. The charger shall not discharge the batteries when AC power fails.
9. The charger shall have the following accessories:

    a. On-off control switch with pilot light.
    b. AC power failure alarm light.
    c. High DC voltage alarm light.
    d. Low DC voltage alarm light.
    e. Ground detection switch and alarm light.
    f. DC ammeter - 2 percent accuracy.
    g. DC voltmeter - 2 percent accuracy: Float/equalize voltage marked in red on voltmeter.

h. Provisions for activation of remote annunciation of trouble for the above conditions.

2.6 SURGE PROTECTIVE DEVICE

A. Refer to Section 26 43 13, SURGE PROTECTIVE DEVICES.

2.7 METERING

A. The metering system shall be provided consistent with the requirements stated in the “Electrical Metering” section described in the BDR.

B. As necessary, provide compartment with a front hinged door to provide safe isolated access to meters and all associated terminal and fuse blocks for maintenance, calibration, or testing.

C. Provide current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.

D. Provide voltage transformers including primary fuses and secondary protective devices for metering as shown on the drawings.

2.8 OTHER EQUIPMENT

A. Furnish tools and accessories required for circuit breaker and switchgear test, inspection, maintenance, and proper operation.

B. Panelboards: Requirements for panelboards shown to be installed in the switchgear shall be as shown on the drawings and in Section 26 24 16, PANELBOARDS.

C. Circuit breaker removal equipment: Furnish a portable circuit breaker removal lift and carriage permanent circuit breaker removal device mounted on top of enclosure for installation and removal of circuit breakers.

2.9 CONTROL WIRING

A. Switchgear control wires shall not be less than No. 14 AWG copper 600 V rated. Install wiring complete at the factory, adequately bundled and protected. Provide separate control circuit fuses in each breaker compartment and locate for ease of access and maintenance.

2.10 NAMEPLATES

A. Nameplates: For Normal Power system, provide laminated black phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. For Essential Electrical System, provide laminated red phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. Nameplates shall indicate equipment served, spaces, or spares in accordance with one line diagram shown on drawings. Nameplates shall be mounted with plated screws on front of breakers or on equipment enclosure next to breakers. Mounting nameplates only with adhesive is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the CEC, as shown on the drawings, and manufacturer's instructions.

B. Anchor switchgear with rustproof bolts, nuts, and washers not less than 13 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.

C. In seismic areas, switchgear shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.

D. Exterior Location. Mount switchgear on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

E. Interior Location. Mount switchgear on concrete slab. Unless otherwise indicated, the slab shall be at least 100 mm (4 inches) thick. The top of the concrete slab shall be approximately 100 mm (4 inches) above finished floor. Edges above floor shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 100 mm (8 inches) beyond the equipment.

Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the required NETA and the manufacturer's recommendations. In addition, include the following:

1. Visual Inspection and Tests:

   a. Compare equipment nameplate data with specifications and approved shop drawings.
   b. Inspect physical, electrical, and mechanical condition.
   c. Confirm correct application of manufacturer's recommended lubricants.
   d. Verify appropriate anchorage, required area clearances, and correct alignment.
   e. Verify that circuit breaker sizes and types correspond to approved shop drawings.
   f. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
   g. Confirm correct operation and sequencing of key-type mechanical interlock systems.
   h. Vacuum-clean switchgear enclosure interior. Clean switchgear enclosure exterior.
   i. Inspect insulators for evidence of physical damage or contaminated surfaces.
   j. Verify correct shutter installation and operation.
   k. Exercise all active components.
   l. Verify the correct operation of all sensing devices, alarms, and indicating devices.
   m. Verify that vents are clear.

2. Electrical tests:

   a. Perform insulation-resistance tests on each bus section.
   b. Perform insulation-resistance test on control wiring; do not perform this test on wiring connected to solid-state components.
   c. Perform phasing check on double-ended switchgear to ensure correct bus phasing from each source.

B. Prior to the final inspection for acceptance, a technical representative from the electric utility company shall witness the testing of the equipment to assure the proper operation of the individual components, and to confirm proper operation/coordination with electric utility company's equipment.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that the switchgear is in good operating condition and properly performing the intended function.

3.4 TEMPORARY HEATING

A. Apply temporary heat to switchgear, according to manufacturer's written instructions, throughout periods when switchgear environment is not controlled for temperature and humidity within manufacturer's stipulated service conditions.

3.5 WARNING SIGN

A. Mount on each entrance door of the outdoor switchgear enclosure/switchgear room/, approximately 1500 mm (5 feet) above grade or floor, a clearly lettered warning sign for warning personnel. The sign shall be attached with rustproof metal screws.

3.6 ONE LINE DIAGRAM AND SEQUENCE OF OPERATION

A. At final inspection, an as-built one line diagram shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.

B. Furnish a written sequence of operation for the switchgear and connected line side/load side electrical distribution equipment. The sequence of operation shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.

C. Deliver an additional four copies of the as-built one line diagram and sequence of operation to the facility Manager.

3.7 AS-LEFT TRIP UNIT SETTINGS

A. The trip unit settings shall be set in the field by an authorized representative of the switchgear manufacturer per the approved Overcurrent Protective Device

Coordination Study in accordance with Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.

B. The trip unit settings of the main breaker(s) shall be reviewed by the electric utility company to assure coordination with the electric utility company primary fusing. Prior to switchgear activation, provide written verification of this review to the Facility Manager and EEOR.

C. Post a durable copy of the "as-left" trip unit settings in a convenient location in the switchgear room/outdoor switchgear enclosure. Deliver four additional copies of the settings to the Owner prior to the activation of the switchgear.

3.8 INSTRUCTION

A. Furnish the services of a factory-trained technician for two, 4-hour training periods for instructing personnel in the maintenance and operation of the switchgear, on the dates requested by the Owner

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SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes main and distribution switchboards.

B. Related Sections:

1. Section 26 0526 - Grounding and Bonding for Electrical Systems.
2. Section 26 0553 - Identification for Electrical Systems.
3. Section 26 2813 – Fuses.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C12.1 - Code for Electricity Metering.
2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.

B. Institute of Electrical and Electronics Engineers:

1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.
2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3. NEMA PB 2 - Deadfront Distribution Switchboards.
4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.

D. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

E. Underwriters Laboratories Inc.:

1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
2. UL 891 - Dead-Front Switchboards.

1.3 SUBMITTALS

A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.

Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

B. Test Reports: Indicate results of factory production and field tests.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.

B. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept switchboards on site. Inspect for damage.

B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 SEQUENCING

A. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Cutler-Hammer/Eaton.
2. GE Electrical & Distribution.
3. Siemens.
4. Square-D.
5. Or approved equal.

2.2 DISTRIBUTION SWITCHBOARDS

A. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.

B. Device Mounting: as indicated on drawings.

C. Front-Connected, Front-Accessible Switchboard: As specified in drawings.

D. Nominal System Voltage: As specified in drawings.

E. Main-Bus Continuous: As specified in drawings.

F. Enclosure: Steel, NEMA 250, Type 1 or 3R.

G. Enclosure Finish: Factory-applied finish in manufacturer's standard gray finish.

H. Barriers: Between adjacent switchboard sections.

I. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

J. Buses and Connections: Three phase, four wire, unless otherwise indicated tin-plated aluminum of 98 percent conductivity with feeder circuit-breaker line connections.

1. Ground Bus: 1/4 by 2 inch (6 by 50 mm) minimum-size, tin-plated aluminum, equipped with pressure connectors for feeder and branch-circuit ground conductors. For bus-way feeders, extend insulated
2. equipment grounding cable to bus-way ground connection and support cable at intervals in vertical run.
3. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections.
4. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
5. Neutral Buses: 100 percent of the ampacity of phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for bus-way feeder neutral bus are braced.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 225 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing, field-replaceable rating plug, and the following field-adjustable settings:

   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I2t response. Where required by code.
      1) GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles. Where requested on plans.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 or 75 percent of rated voltage.
5. Under-voltage Trip: Set to operate at 35 to 75 percent of rated voltage time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

C. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments with I2t response.
    d. Ground-fault pickup level, time delay, and I2t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Control Voltage: 125-V.

2.4 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Product Description: IEEE C62.41, factory-mounted transient voltage surge suppressor, selected to meet requirements for high exposure and to coordinate with system circuit voltage.

2.5 AMMETERS , VOLTMETERS AND POWER METERS

A. Provide GE PQMII digital multi meter.

2.6 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing in accordance with NEMA PB 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surface is suitable for switchboard installation.

3.2 INSTALLATION

A. Install in accordance with NEMA PB 2.1. and NECA 40.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install fuses in each switch and coordinate sizes with connected load.

D. Install engraved plastic nameplates in accordance with Section 26 05 53.

E. Install breaker circuit directory.

F. Ground and bond switchboards in accordance with Section 26 05 26.

G. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.4 ADJUSTING

A. Adjust operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

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SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution and branch circuit panelboards.
2. Electronic grade branch circuit panelboards.
3. Load centers.

B. Related Requirements:

1. Section 26 0526 - Grounding and Bonding for Electrical Systems.
2. Section 26 0553 - Identification for Electrical Systems.

1.2 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
2. NEMA PB 1 – Panelboards.
3. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

1. UL 50 - Cabinets and Boxes.
2. UL 67 - Safety for Panelboards.
3. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
4. UL 1283 - Electromagnetic Interference Filters.
5. UL 1449 - Transient Voltage Surge Suppressors.
6. UL 1699 - Arc-Fault Circuit Interrupters.

1.3 SUBMITTALS

A. Product Data: Submit catalog data showing specified features of standard products.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in manufacturing products specified in this section

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Cutler-Hammer/Eaton.
2. GE Electrical & Distribution.
3. Siemens.
4. Square-D.
5. Or approved equal.

2.2 DISTRIBUTION PANELBOARDS

A. Description: NEMA PB 1, circuit breaker type panelboard.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

C. Main Overcurrent Protective Devices: Circuit breaker.

D. Branch Overcurrent Protective Devices:

1. All circuit breakers as indicated on drawings shall be bolt-on type.

E. Materials

1. Panelboard Bus: Aluminum current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
2. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Enclosures: As indicated on drawings NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

   a. Outdoor Locations: NEMA 250, Type 3R.
   b. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

2. Cabinet Front: Surface or flush as required, with flush lock.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Branch Overcurrent Protective Devices: Bolt on circuit breakers, replaceable without disturbing adjacent units.

C. Doors: hinged door-in-door construction; secured with flush latch with tumbler lock; keyed alike.

D. Materials:

1. Panelboard Bus: Tin-plated aluminum, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

E. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, front hinged to box, and flush lock keyed alike. Finishes: ANSI 61.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.
3. AFC Circuit Breakers: Single-pole configuration for all residential sleeping areas pursuant to the drawings.
4. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

   a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
   c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

5. The 250-amp and 400-amp frame breakers (50% rated) with ETU shall be used for all emergency circuits smaller than 250-amp or 40-amp trip rating that require selective coordination per CEC.

B. Controller Disconnect Switches: Fused switch or Adjustable instantaneous-trip circuit breaker and interlocked with controller.

1. Auxiliary Contacts: Integral with disconnect switches to de-energize external control-power source.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and load centers in accordance with NEMA PB 1.1.

B. Install panelboards and load centers plumb.

C. Install recessed panelboards and load centers flush with wall finishes.

D. Height: 6 feet (1800 mm) to top of panelboard and load center; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.

G. Install engraved plastic nameplates in accordance with Section 26 05 53.

H. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. Check input voltage, examine all mechanical connections.
2. Exercise breakers

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.4 CLEANING

A. Clean existing panelboards and load centers to remain or to be reinstalled.

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SECTION 26 25 00

ENCLOSED BUS ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Feeder-bus assemblies.
2. Plug-in bus assemblies.
3. Bus plug-in devices.

1.3 DEFINITIONS

A. SPD: Surge Protectives Device.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For each type of bus assembly and plug-in device.

1. Show fabrication and installation details for enclosed bus assemblies. Include plans, elevations, and sections of components. Designate components and accessories, including clamps, brackets, hanger rods, connectors, straight lengths, and fittings.
2. Show fittings, materials, fabrication, and installation methods for listed fire-stop barriers.
3. Indicate required clearances, method of field assembly, and location and size of each field connection.
4. Detail connections to switchgear, switchboards, transformers, and panelboards.
5. Wiring Diagrams: Power, signal, and control wiring.
6. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting seismic restraints.
b. Detail fabrication, including anchorages and attachments to structure and to supported equipment.

1.5 SUBMITTALS

A. Shop Drawings: Provide dimensioned plan views and sections indicating proposed busway routing, required clearances, and locations and details of supports, fittings, equipment connections, and firestops and weatherseals at building element penetrations. Indicate voltage and current ratings, short circuit current ratings, configurations, and installed features and accessories. Include details of wall and floor penetrations. Where roof penetrations are required, provide certification that work does not void roof warranty. Provide all required seismic equipment anchorage details and calculations.

B. Product Data: Submit manufacturer's standard catalog pages and data sheets for busway system components and accessories. Include dimensions, weight, materials, fabrication details, finishes, and service condition requirements. Submit seismic certification of equipment:

1. Include busway resistance, reactance, and impedance data, voltage drop ratings and fault current data.
2. Include characteristic trip curves for each type and rating of circuit breaker plug-in device.
3. All instances when feeder busway ampacity exceeds rating of circuit breaker plug-in device(s) shall be coordinated with owner for approval prior to providing submittal for review & approval.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Coordination Drawings: Provide detailed floor plan views and layouts.

1. Indicate busway layout and support locations. Provide isometric drawing.
2. Coordinate the arrangement of busway with structural members, ductwork, piping, equipment and other potential conflicts.
3. Coordinate the work with other trades to avoid installation of obstructions within busway required clearances.
4. Coordinate arrangement of busway with the dimensions and clearance requirements of the actual equipment to be installed.
5. Coordinate the work with placement of supports, anchors, etc. required for mounting.

6. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
7. Where busway extends through roof, coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

E. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of busway routing and location of plug- in units.

B. Provide seismic certification and equipment anchorage details.

C. Test Results: Provide field test results.

D. Operation and Maintenance Data.
1. Submit joint re-tightening schedule.
2. Include information on replacement parts and recommended maintenance procedures and intervals.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section .

1.8 QUALITY CONTROL

A. Manufacture busway in an ISO 9001 certified facility.

B. Provide busway certified for Seismic Withstand Capability in accordance with Code for worst case levels.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handle in accordance with NEMA BU 1.1 and manufacturer's written instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation including outdoor busway, which is not weatherproof until completely and properly installed. Maintain factory wrapping or provide an addi-

tional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install indoor busway until building is closed in and suitable temperature conditions are controlled.

B. Conform to NEMA BU 1 service conditions during and after installation of busway.

1.11 UTILITY INTERCONNECTIONS

A. Coordinate with Utility Company to provide busway connections suitable for system requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Eaton.
2. Square D.
3. General Electric.
4. Substitutions: Not Permitted.

B. Furnish busway system and all associated components and accessories from a single manufacturer and obtained from a single supplier.

C. Listing of an alternate acceptable manufacturer does not indicate or imply acceptance of their standard products. Manufacturers listed above are not relieved from complying with all specified ratings, features and functions. By using a product other than the basis of design the Contractor accepts responsibility for any and all costs associated with any necessary modifications to related work including any design fees, inspection fees and construction management fees.

2.2 BUSWAY

A. Provide busway system consisting of all required components, fittings, devices, supports, accessories, etc. as necessary for a complete operating system.

B. Utility Interconnections: Provide utility company approved cable tap-boxes or other fittings required by utility company.

C. Description: Prefabricated sectionalized enclosed bus assemblies and associated fittings and devices; listed and labeled as complying with UL 857.

D. Busway General Requirements.

1. Busway Type: Feeder or Plug-in type as indicated, totally enclosed, low impedance, 100% neutral, 50% internal ground bus, non-ventilated; suitable for installation in any mounting orientation the busway is designed for (horizontal flatwise, horizontal edgewise, vertical) without derating.
2. Enclosure: IP54 Sprinkler proof for indoor installations.
3. Temperature Rise: Not exceeding 55 degrees C, when operating at continuous rated current in an ambient temperature of 104 degrees F (40 degrees C).
4. Bus bars and stabs to be suitably plated at all electrical contact points.
5. Both feeder and plug-in busway rated 800 A and above to be of sandwich type construction, with no air gaps between bus bars except at plug-in openings.
6. Bus bar Insulation: NEMA Class B, rated 266 degrees F (130 degrees C).
7. Housing: Constructed with code gage steel or aluminum to reduce hysteresis and eddy current losses, with suitable protective finish of ANSI 49 gray polyester paint or ANSI 61 epoxy powder paint applied by an automated electrostatic process.
8. Conductors: Copper bars, fully insulated except at joints.
9. Joints: Single bolt type, with silver-plated contact surface for bus and splice plate., with high strength steel bolts and conical washers to maintain proper pressure over a large contact surface area:

    a. Use torque-indicating bolts with visual indication that proper torque has been applied; requires only a standard long handle wrench for proper activation.
    b. Bolts to be at ground potential to allow adjustment without requiring de- energizing of busway.
    c. Designed such that tightening of joints only requires access to one side of busway.
    d. Allows for length adjustment of plus/minus 0.125 inch (3.2 mm).
    e. For busway rated 800 A and above, joint connection assemblies to be removable to allow electrical isolation or physical removal of a busway length without disturbing adjacent busway lengths.

10. Voltage Drop.

a. Voltage drop specified is based on the busway operating at full rated current and at stabilized operating temperature in 86 degrees F (30 degrees C) ambient.
b. Do not exceed 3.1 volts per 100 feet (30.48 m) for three phase, line-to-line voltage drop at 40 percent power factor concentrated load.
c. Do not exceed 4.0 volts per 100 feet (30.48 m) for line-to-line voltage drop at the load power factor that produces maximum voltage drop in the busway.
d. Do not exceed a total busway voltage drop that causes the total feeder voltage drop to exceed 2 percent as required by California Title 24 Building Energy Efficiency Standards. The total feeder voltage drop includes the total feeder length from the service entrance equipment to the branch circuit panel with the largest calculated voltage drop.
e. For purposes of voltage drop calculations assume a total load equal to 80% of the device rating serving the busway

E. Short Circuit Current Rating.

1. Provide busway system and associated components with listed short circuit current rating not less than 130% of the available fault current at the installed location as determined by short circuit study or as indicated on the drawings, whichever is higher. Where no available fault currents are indicated provide short circuit current rating equal to the short circuit current rating of the switchgear serving the busway.
2. Listed series ratings are not acceptable. Provide fully-rated busway.

2.3 SOURCE QUALITY CONTROL

A. Inspect and test according to NEMA BU1 and NETA ATS.

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Remove exposed abandoned busways, including abandoned busways above accessible ceiling finishes. Patch surfaces.

B. Maintain access to existing busways and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Extend existing busway installations using materials and methods as specified.

D. Clean and repair existing busways to remain or to be reinstalled.

3.2 PREPARATION

A. Perform insulation resistance testing on individual current-carrying busway system components prior to installation in accordance with NECA 408 and NEMA BU1.1.

B. Verify that field measurements are as shown on drawings.

C. Verify that the ratings of busway system components are consistent with the indicated requirements.

D. Verify that mounting surfaces are ready to receive busway and associated supports.

E. Verify that conditions are satisfactory for installation prior to starting work".

3.3 INSTALLATION

A. Install in accordance with NEMA BU1.1 and with manufacturer’s instructions.

B. Arrange busway parallel and perpendicular to building lines.

C. Install busway plumb and level with sections aligned and with horizontal runs at the proper elevation.

D. Arrange busway to provide required clearances and maintenance access for busway and for other equipment adjacent to busway.

E. Unless otherwise indicated, orient horizontal plug-in busway with plug-in openings on sides to permit practical use of all plug-in openings.

F. Maintain proper phase sequence throughout busway system, accounting for phase transitions where applicable.

G. Tighten joints using torque wrench, to manufacturer's specified values.

H. Install busway length with expansion fitting at each location where busway run crosses building expansion joint or in long straight runs for temperature expansion/contraction in accordance with manufacturer’s instructions.

I. Mount horizontal busway runs in flatwise position.

J. Provide end closures at unconnected ends of busway runs.

K. Busways in electrical rooms shall be plug in type with minimum of (2) plug provisions for future and clear space around each plug provision.

L. Each busway in electrical room shall be provided with a busway T stub for future connections and clear space around each T provision.

M. Support busway at intervals not exceeding 5 feet as required by the NEC. Support intervals for indoor busway may exceed 5 feet where designed and recommended by the manufacturer with a maximum spacing of 10 feet. Support vertical riser at each floor. Use suitable spring hangers for vertical riser applications where busway penetrates and is supported by building floors. Use manufacturer's recommended hangers and supports or provide required support and attachment components in accordance with Section 26 05 29.

N. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

O. Provide sway bracing as required to keep busway runs straight and prevent rotation and movement, accounting for unbalanced weight distribution of plug-in units where applicable.

P. Install busway with integral fire stops located where busway penetrates fire-rated walls and floors. Seal around opening to maintain fire-rating equal to wall or floor rating.

Q. Install 4-inch concrete curb around interior floor penetrations.

R. Install busway with integral weather seal located where busway penetrates exterior wall or roof. Provide wall or roof flange and seal around opening to maintain weathertight installation. Seal roof penetrations as required to preserve integrity of roofing system and maintain roof warranty.

S. Outdoor Feeder Busway: Arrange busway to prevent water infiltration through drain holes from rain or snow. Seal joints in accordance with manufacturer's instructions and remove drain hole plugs.

T. Install plug-in units in accordance with manufacturer's instructions. Provide independent supports where recommended by manufacturer. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study.

U. Install fuses in fused switches.

V. Select and install heater elements in motor controllers to match installed motor characteristics.

W. Install permanent markings on busway as required in the Identification for Electrical Systems section 26 05 54.

X. Ground and bond busway in accordance with Section 26 05 27. Where integral housing ground is utilized, verify joint covers and other components required for continuity are properly installed.

Y. Clean dirt and debris from busway enclosure and components in accordance with manufacturer's instructions. Do not use compressed air or a blower in order to prevent debris infiltration. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

Z. Adjusting:

1. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
2. Adjust supports as required to minimize strain on busway and associated components.

3.4 FIELD QUALITY CONTROL

A. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing.

B. Electrically isolate busway system before energizing and perform insulation resistance testing in accordance with NECA 408 and NEMA BU1.1.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Perform infrared scanning of energized busway system under maximum load conditions in accordance with NECA 408.

D. In addition to tests specified, inspect and test in accordance with NETA ATS, except Section 4. Perform inspections and tests listed in NETA ATS, Section 7.4.

E. Correct deficiencies and replace damaged or defective busway system components.

F. Include test reports with close-out submittals.

G. Training: Provide minimum of two hours of training for Owner's personnel on the operation, adjustment and maintenance of system. Use operation and maintenance manual as training reference supplemented with additional training materials as required. Provide training at project site.

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SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, Connectors, Switches, and Finish Plates.

B. Related Sections:

1. Section 01 8113 - Sustainable Design Requirements.
2. Section 26 0553 - Identification for Electrical Systems.

1.2 REFERENCES

A. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. WD 1 "General Color Requirements for Wiring Devices".
2. WD 6 "Wiring Devices - Dimensional Requirements".

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code".

C. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard for Wire Connectors and Soldering Lugs for Use with Copper Conductors".
2. 486B "Standard for Wire Connectors for Use with Aluminum Conductors".

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. Submit in accordance with Section 26 05 00 indicating specified items selected for use in Project with the following supporting data:

1. Product Data

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

A. Furnish extra materials described in Section 01 7843 "Spare Parts and Materials" that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Receptacles, Switches and Wall Plates

a. Cooper Wiring Devices.
b. Hubbell Wiring Devices.
c. Leviton.
d. GE Wiring Devices.
e. Or approved equal.

2. Wiring Devices:

a. Cooper Wiring Devices.
b. Hubbell Wiring Devices.
c. Leviton.

d. GE Wiring Devices.
e. Or approved equal.

3. Illuminated Night Light with Sensor

a. Cooper Wiring Devices.
b. Hubbell Wiring Devices.
c. Leviton.
d. GE Wiring Devices.
e. Or approved equal.

4. Pendant Cord and Connector Devices

a. Cooper Wiring Devices.
b. Hubbell Wiring Devices.
c. Leviton.
d. GE Wiring Devices.
e. Or approved equal.

5. Cord and Plug Sets

a. Cooper Wiring Devices.
b. Hubbell Wiring Devices.
c. Leviton.
d. GE Wiring Devices.
e. Or approved equal.

6. Multioutlet Assemblies:

a. Hubbell.
b. Wiremold.
c. Or approved equal.

7. Poke-through, Floor Boxes, Floor Service Outlets and Telephone/Power Poles:

a. Hubbell.
b. Wiremold.
c. Or approved equal.

2.2 RECEPTACLES

A. Straight Blade and Locking Type Receptacles: Hospital grade, 125V, NEMA 5-15R or NEMA 5-20R duplex type. Receptacle rating to match panelboard breaker size.

B. GFCI Receptacles: Hospital grade, Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4 inch deep outlet box without an adapter.

C. Locking Receptacles: Heavy-Duty grade.

D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap.

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

A. Snap Switches

1. Locations: Commercial Areas

a. Hospital grade.
b. Color: TBD.
c. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
d. Switch: 20 A, 120/277-VAC.
e. Where more than one switch occurs at the same location, they shall be ganged under one plate. Where space does not permit horizontal ganging, interchangeable type switches may be used, only with approval of the Owner’s Representative.

B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Control: Continuously adjustable slide. Single-pole or three-way switch to suit connections.
2. LED Lamp Dimmers: 120V; 0-10VDC continuous dimming, listed for the use with 0-10VDC dimming.
3. Color: TBD.

C. Illuminated Night Light with Sensor:

1. Decorator light with light sensor: "Model TMHWL-CC (Clear)"; Legrand.

2. Impact-resistant face and back body. Energy-efficient LED light source with GE Lexan high impact-resistant lens. External screw-pressure-plate back and side wired. Accepts #12 and #14 AWG. Sensor automatically turns light ON.

2.4 WALL PLATES

A. Single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Provide plates for all devices and outlets with opening configuration suitable for devices to be covered.
3. Plates shall be smooth urea plastic secured in place with screws finished to match the plates. Back of the house areas, such as equipment spaces, shall have steel plates. Stainless steel plates shall be used in commercial kitchens. Weatherproof plates shall be used where exposed to the weather or in pool area.
4. Color: Red.

2.5 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Die-cast aluminum, satin finished.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

2.7 POKE-THROUGH ASSEMBLIES

A. Description: Factory-fabricated and -wired assembly of below-floor junction box unit with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.

1. Size: Selected to fit nominal 3 inch cored holes in floor and matched to floor thickness.
2. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
3. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish fire rating of floor.
4. Wiring: Three No. 12 AWG power and ground conductors; one 75 ohm coaxial telephone/data cable; and one four-pair, 75 ohm telephone/data cable.

2.8 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Metal, with manufacturer's standard finish.

C. Wire: No. 12 AWG.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Protect devices and assemblies during painting. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems".

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2. Receptacles: Identify panelboard and circuit number from which served within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers' published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace factory stained or improperly painted wall plates or devices.

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SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 300V AC and less for use in enclosed switches.
2. Spare-fuse cabinets.

B. Related Sections include the following:

1. Section 26 2816 "Enclosed Switches and Circuit Breakers."
2. Section 26 2413 Switchboards".
3. Section 26 2416 "Panelboards".

1.3 SUBMITTALS

A. Product Data: For the following:

1. For each fuse type indicated:

   a. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

      1) For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      2) Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

3. Fuse sizes for elevator feeders and elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Shawmut, Inc.

4. Littelfuse, Inc.
5. Or approved equal.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2 inch high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Fuse selection has been based on characteristics published by Bussman. If fuses by other manufacturer are supplied, coordinate the entire distribution system and submit for evaluation.
2. All fuses shall be current limiting type, rated at 200,000 ampere IC.
3. Dual Element, Time Delay, Maximum Rating: 600 ampere at required voltage.
   Equal to type FA or FB (UL Class RK5).
   Equal to type FC or FD (UL Class RK1).
4. Time Delay Type, Over 600 Ampere: Equal to Type FE (UL Class L).
5. Fast Acting Type:
   Equal to type FF or FG (UL Class RK1) up to 600 ampere.
   Equal to type FH (UL Class L) over 600 ampere.
6. All Fuses: Same manufacturer.
7. For types see SCHEDULES at the end of this Section.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. 3.04 Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

3.5 SCHEDULES

A. See approved Construction Drawings for the types of fuses.

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SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association (NETA).

1. Testing Agency's Field Supervisor: Person currently certified by NETA or the National Institute for Certification in Engineering Technologies, to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

B. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

C. Siemens Energy & Automation, Inc.

D. Square D; a brand of Schneider Electric.

E. Or approved equal.

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories (As required):

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Lugs: Compression type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.
8. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac.

2.3 NON-FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories (As required):

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Lugs: Compression type, suitable for number, size, and conductor material.
6. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: 225A and larger. Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 225 A and larger.

C. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

D. Electronic Trip Circuit Breakers: 600A and larger. Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I2t response.

E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6 mA trip).

F. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30 mA trip).

G. The 250-amp and 400-amp frame breakers with ETU shall be used for all emergency circuits smaller than 250-amp or 400-amp trip rating that require selective coordinate per CEC.

H. Features and Accessories (As required):

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 26 09 13 "Electrical Power Monitoring and Control".
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One “NO “contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted and powered; 24-V dc.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

3. Kitchen Areas: Type 4X.
4. Other Wet or Damp, Indoor Locations: Type 4.
5. Hazardous Areas Indicated on Drawings: Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with code approved mounting and anchoring requirements.

C. Install fuses in fusible devices.

D. Comply with NECA 1

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems".

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification.

B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study".

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SECTION 26 33 53

STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Three-phase, on-line, double-conversion, static-type, UPS units with the following features:

   a. Rectifier-charger.
   b. Inverter.
   c. Controls and indications.
   d. Static bypass transfer switch.
   e. External maintenance bypass/isolation switch.
   f. Remote status and alarm panels.
   g. Remote monitoring provisions.
   h. Battery and battery disconnect device.
   i. Battery monitoring.
   j. Special seismic certification.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GTO: Gate turn-off thyristor.

C. IGBT: Isolated gate bipolar transistor.

D. LCD: Liquid-crystal display.

E. LED: Light-emitting diode.

F. NiCd: Nickel cadmium.

G. PC: Personal computer.

H. SPD: Surge protection device.

I. THD: Total harmonic distortion.

J. UPS: Uninterruptible power supply.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of UPS.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for UPS.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For UPS.

1. Include plans, elevations, sections, and wiring details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.
4. Include diagrams for power, signal, and control wiring.

1.5 INFORMATION SUBMITTALS

A. Qualification Data: For power quality specialist and testing agency.

B. Seismic Qualification Certificates: For UPS equipment, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Factory Test Reports: Comply with specified requirements.

D. Product Test Reports: Indicate test results compared with specified performance requirements and provide justification and resolution of differences if values do not agree.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For UPS units to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Power Quality Specialist Qualifications: A registered professional electrical engineer or engineering technician, currently certified by the National Institute for Certification in Engineering Technologies, NICET Level 4, minimum, experienced in performance.

B. testing UPS installations and in performing power quality surveys similar to that required in "Performance Testing" Article.

C. Testing Agency Qualifications: Certified by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.8 WARRANTY

A. Special Battery Warranties: Manufacturer and Installer agree to repair or replace UPS system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for Valve-Regulated, Lead-Calcium Batteries: Equal to or greater than that represented in manufacturer's published table, but not less than the following, based on annual average battery temperature of 77 deg F (25 deg C):
2. 3 year battery parts and labor

PART 2 - PRODUCTS

2.1 OPERATIONAL REQUIREMENTS

A. Automatic operation includes the following:

1. Double Conversion, IGBT:

a. Normal Conditions: Load is supplied with power flowing from the

normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output. High-efficiency carrier stored trench IGBT, in both rectifier-charger and inverter circuits, provides a minimum of 97 percent efficiency for the UPS system at full load and a minimum of 94 percent efficiency at 50 percent load.

b. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to provide constant, regulated inverter power output to the load.

c. Power Failure: If normal power fails, the rectifier-charger and inverter use energy from the battery to supply constant, regulated power output to the load without switching or disturbance.

2. When power is restored at the normal supply terminals of the system, controls shall automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger shall supply power to the load through the inverter and simultaneously recharge the battery.
3. If the battery becomes discharged and normal supply is available, the rectifier-charger shall charge the battery. The rectifier-charger shall automatically shift to float-charge mode on reaching full charge.
4. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch shall switch the load to the normal ac supply circuit without disturbance or interruption.
5. The output power converters shall produce up to 300 percent of rated full-load current for short-circuit clearing. The inverter shall sustain steady-state overload conditions of up to 200 percent of rated full-load current for 60 seconds in normal operation.
6. The inverter shall be capable of sustaining 150 percent of system capacity for 30 seconds while powered from the battery.
7. Should overloads persist past the time limitations, the automatic static transfer switch shall switch the load to the bypass output of the UPS. When the fault has cleared, the static bypass transfer switch shall return the load to the UPS system.
8. If the battery is disconnected, the UPS shall supply power to the load from the normal supply with no degradation of its regulation of voltage and frequency of the output bus.

B. Manual operation includes the following:

1. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal ac supply circuit without disturbance or interruption.
2. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

C. Maintenance Bypass/Isolation Switch Operation: Switch is interlocked so it cannot be operated unless the static bypass transfer switch is in the bypass mode. Device provides manual selection among the three conditions described below without interrupting supply to the load during switching:

1. Full Isolation: Load is supplied, bypassing the UPS. Normal UPS ac input circuit, static bypass transfer switch, and UPS load terminals are completely disconnected from external circuits.
2. Maintenance Bypass: Load is supplied, bypassing the UPS. UPS ac supply terminals are energized to permit operational checking, but system load terminals are isolated from the load.
3. Normal: Normal UPS ac supply terminals are energized, and the load is supplied through the static bypass transfer switch and the UPS rectifier-charger and inverter, or the battery and the inverter.

D. Environmental Conditions: The UPS shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability, except battery performance:

1. Ambient Temperature for Electronic Components: 32 to 104 deg F (0 to 40 deg C).
2. Ambient Temperature for Battery: 77 deg F, plus or minus 3 Deg F
3. Relative Humidity: Zero to 95 percent, noncondensing.
4. Altitude: Sea level to 4000 feet (1220 m).

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: UPS shall withstand the effects of earthquake motions and carry special certification and label California Building Code (CBC).
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. UL Compliance: Listed and labeled by an NRTL to comply with UL 1778.

C. NFPA Compliance: UPS components shall be listed and labeled by an NRTL as suitable for installation in computer rooms according to NFPA 75.

D. The UPS shall perform as specified in this article while supplying rated full-load current, composed of any combination of linear and nonlinear load, up to 100 percent nonlinear load with a maximum load crest factor of 3.0, under the following conditions or combinations of the following conditions:

1. Inverter is switched to battery source.
2. Steady-state ac input voltage deviates up to plus or minus +10% to -15% from nominal voltage.
3. Steady-state input frequency deviates up to plus or minus 5 percent from

nominal frequency.

4. THD of input voltage is 15 percent or more with a minimum crest factor of 3.0, and the largest single harmonic component is a minimum of 5 percent of the fundamental value.
5. +/-5% for 100 percent load unbalanced.

E. N+1 redundant, scalable array architecture. System power train shall be comprised of 10kVA/10kW power modules.

F. Minimum Duration of Supply: If battery is sole energy source supplying rated full-load UPS current at Unity power factor, duration of supply is nine (9) minutes.

G. Input Voltage Tolerance: System steady-state and transient output performance remains within specified tolerances when steady-state ac input voltage varies plus 10 percent and minus 15 percent from nominal voltage.

H. Overall UPS Efficiency: Equal to or greater than 95 percent at 100 percent load, 95 percent at 75 percent load, and 93 percent at 25 percent load.

I. Maximum Acoustical Noise: 75dBA, emanating from any UPS component under any condition of normal operation, measured 1M from nearest surface of component enclosure.

J. AC Output-Voltage Regulation for Loads 100 Percent Unbalanced: Maximum of plus or minus 2 percent over the full range of battery voltage.

K. AC Output-Voltage Regulation for Loads 100 Percent Balanced: Maximum of plus or minus 1 percent over the full range of battery voltage.

L. Output Frequency: 60 Hz, plus or minus 0.1 percent over the full range of input voltage, load, and battery voltage.

M. Limitation of harmonic distortion of input current to the UPS shall be as follows:

1. Description: Rectifier-charger circuits shall limit THD to 5 percent, maximum, at rated full-load UPS current, for power sources with X/R ratio between 2 and 30. Provide tuned harmonic filter if required to meet harmonic distortion limit.
2. Description: THD is limited to a maximum of 32 percent, at rated full-load UPS current, for power sources with X/R ratio between 2 and 30.

N. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for 100 percent rated nonlinear load current with a load crest factor of 3.0.

O. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for rated full load with THD up to 50 percent, with a load crest factor of 3.0.

P. Minimum Overload Capacity of UPS at Rated Voltage: 110 percent of rated full load for 10 minutes, 125 percent for 2 minutes in normal operation, and 150 percent for 15 seconds in battery operating mode.

Q. Maximum Output-Voltage Transient Excursions from Rated Value: For the following instantaneous load changes, stated as percentages of rated full UPS load, voltage shall remain within stated percentages of rated value and recover to, and remain within, plus or minus 2 percent of that value within 50 ms:

1. 50 Percent: Plus, or minus 3 percent.
2. 100 Percent: Plus, or minus 5 percent.
3. Loss of AC Input Power: Plus, or minus 1 percent.
4. Restoration of AC Input Power: Plus, or minus 1 percent.

R. Input Power Factor: A minimum of 0.95 lagging when supply voltage and current are at nominal rated values and the UPS is supplying rated full-load current without additional filters.

S. Output Power Factor Rating: Loads with power factor of 0.9 leading to 0.8 lagging shall not require derating of the UPS.

T. EMI Emissions: Comply with FCC rules and regulations and with 47 CFR 15 for Class A equipment.

2.3 UPS SYSTEMS

A. Description: Self-contained, battery backup device and accessories that provides three-phase electrical power in the event of failure or sag in the normal power system.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. APC/Galaxy by Schneider Electric.
2. Powerware by Eaton Corporation
3. Liebert.
4. Toshiba.
5. Or approved equal.

C. Electronic Equipment: Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, static bypass transfer switch, and system controls.

D. Enclosures: Comply with NEMA 250, Type 1, unless otherwise indicated.

E. Configuration: Single-cabinet modular style units.

F. Control Assemblies: Mount on modular plug-ins, readily accessible for mainte-

nance.

G. Maintainability Features: Mount rectifier-charger and inverter sections and the static bypass transfer switch on modular plug-ins, readily accessible for maintenance.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Seismic-Restraint Design: UPS assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces as required by structural EOR or as required by OSHPD certification.

J. UPS Cabinet Ventilation: Redundant fans or blowers draw in ambient air near the bottom of cabinet and discharge it near the top rear.

K. Output Circuit Neutral Bus, Conductor, and Terminal Ampacity: Rated phase current times a multiple of 1.73, minimum.

2.4 RECTIFIER-CHARGER

A. Description: Voltage source converter, IGBT rectifier.

B. Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for duration of supply under battery power at full load.

C. Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak to peak.

D. Control Circuits: Immune to frequency variations within rated frequency ranges of normal and emergency power sources.

1. Response Time: Field adjustable for maximum compatibility with local generator-set power source.

E. Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life. The battery charger shall be matched to the battery type supplied.

2.5 INVERTER

A. Description: Pulse-width modulated, IGBT 3 Level design with sinusoidal output. Include a bypass phase synchronization window adjustment to optimize

compatibility with local engine-generator-set power source.

2.6 CONTROLS AND INDICATIONS

A. Description: Group displays, indications, and basic system controls on a common control panel on front of UPS enclosure.

B. Minimum displays, indicating devices, and controls include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms include audible signals and visual displays.

C. Indications: Plain-language messages on a digital touchscreen color display.

1. Quantitative indications shall include the following:

    a. Input voltage, each phase, line to line.
    b. Input current, each phase, line to line.
    c. Bypass input voltage, each phase, line to line.
    d. Bypass input frequency.
    e. System output voltage, each phase, line to line.
    f. System output current, each phase.
    g. System output frequency.
    h. DC bus voltage.
    i. Battery current and direction (charge/discharge).
    j. Elapsed time discharging battery.

2. Basic status condition indications shall include the following:

    a. Normal operation.
    b. Load-on bypass.
    c. Load-on battery.
    d. Inverter off.
    e. Alarm condition.

3. Alarm indications shall include the following:

    a. Bypass ac input overvoltage or undervoltage.
    b. Bypass ac input overfrequency or underfrequency.
    c. Bypass ac input and inverter out of synchronization.
    d. Bypass ac input wrong-phase rotation.
    e. Bypass ac input single-phase condition.
    f. Bypass ac input filter fuse blown.
    g. Internal frequency standard in use.
    h. Battery system alarm.
    i. Control power failure.
    j. Fan failure.

k. UPS overload.
l. Battery-charging control faulty.
m. Input overvoltage or undervoltage.
n. Input transformer overtemperature.
o. Input circuit breaker tripped.
p. Input wrong-phase rotation.
q. Input single-phase condition.
r. Approaching end of battery operation.
s. Battery undervoltage shutdown.
t. Maximum battery voltage.
u. Inverter fuse blown.
v. Inverter transformer overtemperature.
w. Inverter overtemperature.
x. Static bypass transfer switch overtemperature.
y. Inverter power supply fault.
z. Inverter transistors out of saturation.
aa. Identification of faulty inverter section/leg.
bb. Inverter output overvoltage or undervoltage.
cc. UPS overload shutdown.
dd. Inverter current sensor fault.
ee. Inverter output contactor open.
ff. Inverter current limit.

4. Controls shall include the following:

a. Inverter on-off.
b. UPS start.
c. Battery test.
d. Alarm silence/reset.
e. Output-voltage adjustment.

D. Dry-form "C" contacts shall be available for remote indication of the following conditions:

1. UPS on battery.
2. UPS on-line.
3. UPS load-on bypass.
4. UPS in alarm condition.
5. UPS off (maintenance bypass closed).

E. Emergency Power off Switch: Capable of local operation and operation by means of activation by external dry contacts.

2.7 STATIC BYPASS TRANSFER SWITCH

A. Description: Solid-state switching device providing uninterrupted transfer with a contactor or electrically operated circuit breaker to automatically provide electri-

cal isolation for the switch.

B. Switch Rating: Continuous duty at the rated full-load UPS current, minimum.

2.8 MAINTENANCE BYPASS/ISOLATION SWITCH

A. Description: Manually operated switch or arrangement of switching devices with mechanically actuated contact mechanism arranged to route the flow of power to the load around the rectifier-charger, inverter, and static bypass transfer switch.

1. Switch shall be electrically and mechanically interlocked to prevent interrupting power to the load when switching to bypass mode.
2. Switch shall electrically isolate other UPS components to permit safe servicing.
3. Switch shall electrically isolate the rectifier-charger, inverter, and static bypass transfer switch from the load, but shall allow primary power to the UPS for testing.
4. Switch shall be 3 breaker type rated at AIC as shown on one line contract drawings.

B. Comply with NEMA PB 2 and UL 891.

C. Switch Rating: Continuous duty at rated full-load UPS current.

D. Mounting Provisions: External floor-mounted unit with OSHPD Certification.

E. Key interlock with key that is released only when the rectifier-charger and inverter are bypassed by the static bypass transfer switch. Key shall be required to unlock maintenance bypass/isolation switch before switching from open (normal) position to closed position. Lock shall be designed specifically for mechanical and electrical component interlocking.

2.9 REMOTE STATUS AND ALARM PANEL

A. Description: Labeled LEDs on panel faceplate indicating basic status conditions. Audible signal indicates alarm conditions. Silencing switch in face of panel silences signal without altering visual indication.

1. Cabinet and Faceplate: Surface or flush mounted to suit mounting conditions indicated.

2.10 REMOTE MONITORING

A. Description: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in "Controls and

Indications" Article. The remote computer and the connecting signal wiring are not included in this Section. Include the following features:

1. Connectors and network interface units for data transmission via RS-485, Ethernet, or web-based link.
2. Software designed for control and monitoring of UPS functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of meaningful reports. Permit storage and analysis of power-line transient records. Designs for Windows applications, software, and computer are not included in this Section.
3. SNMP output/interface device to interface with UPS manufacturer HTML web browser server software and/or for integration into owner management system software as required.
4. Provide network card to interface with BMS.

2.11 BATTERY (VRLA)

A. Description: Valve-regulated, recombinant, lead-calcium units, factory assembled in an isolated compartment of UPS cabinet, complete with battery disconnect switch.

1. Arrange for draw out removal of battery assembly from cabinet for testing and inspecting.
2. Factory assembled in an isolated compartment of UPS cabinet.
3. Mount in OSHPD certified cabinet.
4. Arrange for drawout removal of battery assembly from cabinet for testing and inspecting.
5. Provide run time for kW rating of UPS and at 1.67VPC cut off voltage.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following but not limited to:

1. C&D Technologies, Inc..
2. Eaton Corporation
3. EnerSys.
4. Or approved equal.

C. Seismic-Restraint Design: Battery racks, cabinets, assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces and carry a current OSHPD OSP.

2.12 SOURCE QUALITY CONTROL

A. Factory test complete UPS system before shipment. Use simulated battery testing. Include the following:

1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the UPS.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify installation conditions are representative of the conditions used in the coordination studies for the electrical system. Provide fuse protection according to Section 262813 "Fuses" if required for coordination with UPS overcurrent protective device requirements.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for cable trays specified in Section 260536 "Cable Trays for Electrical Systems."
3. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending ra-

dii. Install lacing bars and distribution spools.

E. Equipment Mounting: Install UPS on concrete base. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete." nd Section03 30 53 "Miscellaneous Cast-in-Place Concrete."

F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

G. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated. Apply oxide inhibitor on battery terminals.

3.3 GROUNDING

A. Separately Derived Systems: If not part of a listed power supply for a data-processing room, comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Separately Derived Systems: If part of a listed power supply for a data-processing room, comply with manufacturer's written instructions that include grounding requirements in excess of NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Factory Testing:
Inverter system shall be tested during manufacturing process to assure that equipment is fully functioning and its performance meets specifications. Upon request, manufacturer shall describe testing program and supply sample test procedures and test data sheets to document testing program.

B. Site Testing:

Inverter equipment shall be fully tested after installation. Testing shall be part of start-up service provided by manufacturer. Site testing shall include

complete inspection of installation to assure it was performed in accordance with manufacturer's recommendations.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the UPS.

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SECTION 26 36 00

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Section 26 0500 "Common Work Results for Electrical".
2. Section 26 0573 "Overcurrent Protective Device Coordination Study".
3. Section 26 0548 "Vibration and Seismic Controls for Electrical Systems".

1.2 SUMMARY

A. This Section includes open transition transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote annunciation systems.

1.3 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For the following:

   a. For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

2. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

   a. Single-Line Diagram: Show connections between switches, power sources, and loads; show interlocking provisions for each switch.

B. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification, available on a 7x24x365 call basis.

B. Source Limitations: Obtain automatic transfer switches remote annunciators through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:
   GE Zenith.
   Automatic Switch Company (ASCO).
   Russelectric, Inc.
   Cummins.
   Or approved equal.

2.2 GENERAL TRANSFER SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

   1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full--rated current between active power sources.

   1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
   2. Switch Action: Double throw; mechanically held in both directions.
   3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

I. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems".

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

J. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Automatic Open-Transition Transfer Switches: Fully automatic break-before-make operation.

G. Automatic Transfer-Switch Features:

1. Under-voltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained under-voltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Provide two sets of Form 'C' contacts with time delay for customer functions, elevator signal contacts to operate prior to transfer from either normal to emergency or from emergency to normal.
8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available".
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available".

9. Unassigned Auxiliary Contacts: Two normally open, single-pole, double--throw contacts for each switch position, rated 10 A at 240V ac.
10. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
11. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32V dc minimum.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and huts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7 day exercise cycle, 20 minute running period, and 5 minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Pushbutton programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock the bypass/isolation switch in the position that isolates the transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provides physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
4. Contact temperatures of bypass/isolation switches do not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs give detailed operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed aluminum bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems".

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems".

C. Annunciator Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Division 26 Section "Identification for Electrical Systems".

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to the Rose Bowl if necessary to accommodate required wiring.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems".

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables".

D. Furnish and install all power and interconnect control, annunciator and alarm wiring between transfer switches, the generator system or switchgear, and other remote monitoring device.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training".

B. Coordinate this training with that for generator equipment.

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SECTION 26 43 13

SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of Type 2 Surge Protective Devices, as defined in NFPA 70, and indicated as SPD in this section.

1.2 RELATED WORK

A. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL: Requirements that apply to all sections of Division 26.

B. Section 26 2300, LOW-VOLTAGE SWITCHGEAR: For factory-installed or external SPD.

C. Section 26 2413, SWITCHBOARDS: For factory-installed or external SPD.

D. Section 26 2416, PANELBOARDS: For factory-installed or external SPD.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.

1.4 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, and the following requirements:
   1. Shop Drawings:
      a. Submit sufficient information to demonstrate compliance with drawings and specifications.
      b. Include electrical ratings and device nameplate data.
   2. Manuals:
      a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical

data sheets, wiring diagrams, and information for ordering replacement parts.

b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

3. Certifications: Two weeks prior to final inspection, submit the following.

a. Certification by the manufacturer that the SPD conforms to the requirements of the drawings and specifications.

b. Certification by the Contractor that the SPD has been properly installed.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplement and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. Institute of Engineering and Electronic Engineers (IEEE):

IEEE C62.41.2-02.....Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.45-08.....Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

C. National Fire Protection Association (NFPA):

70-17.....National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

UL 1283-17.....Electromagnetic Interference Filters

UL 1449-21.....Surge Protective Devices

PART 2 - PRODUCTS

2.1 SWITCHGEAR/SWITCHBOARD SPD

A. General Requirements:

1. Comply with IEEE and UL.
2. Modular design with field-replaceable modules, or non-modular design.
3. Fuses, rated at 200 kA interrupting capacity.
4. Bolted compression lugs for internal wiring.

5. Integral disconnect switch.
6. Redundant suppression circuits.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device.
10. Four-digit transient-event counter.

B. Surge Current per Phase: Minimum 240kA per phase.

2.2 PANELBOARD SPD

A. General Requirements:
1. Comply with UL 1449 and IEEE C62.41.2.
2. Modular design with field-replaceable modules, or non-modular design.
3. Fuses, rated at 200 kA interrupting capacity.
4. Bolted compression lugs for internal wiring.
5. Integral disconnect switch.
6. Redundant suppression circuits.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device.
10. Four-digit transient-event counter.

B. Surge Current per Phase: Minimum 120kA per phase.

2.3 ENCLOSURES

A. Enclosures: NEMA 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the CEC, as shown on the drawings, and manufacturer's instructions.

B. Factory-installed SPD: Switchgear, switchboard, or panelboard manufacturer shall install SPD at the factory.

C. Field-installed SPD: Contractor shall install SPD with conductors or buses between SPD and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
   1. Provide a circuit breaker as a dedicated disconnecting means for SPD as shown on drawings.

D. Do not perform insulation resistance tests on switchgear, switchboards, panelboards, or feeders with the SPD connected. Disconnect SPD before conducting insulation resistance tests, and reconnect SPD immediately after insulation resistance tests are complete.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:

   1. Visual Inspection and Tests:
      a. Compare equipment nameplate data with specifications and approved shop drawings.
      b. Inspect physical, electrical, and mechanical condition.
      c. Verify that disconnecting means and feeder size and maximum length to SPD corresponds to approved shop drawings.
      d. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method.
      e. Vacuum-clean enclosure interior. Clean enclosure exterior.
      f. Verify the correct operation of all sensing devices, alarms, and indicating devices.

3.3 FOLLOW-UP VERIFICATION

A. After completion of acceptance checks and tests, the Contractor shall show by demonstration in service that SPD are in good operating condition and properly performing the intended function.

3.4 INSTRUCTION

A. Provide the services of a factory-trained technician for one 2-hour training period for instructing personnel in the maintenance and operation of the SPD.

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SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior Lighting Fixtures.
2. LED Lamps.
3. LED Drivers.
4. Exit Signs.
5. Emergency Lighting Units.
6. Accessories.

B. Related Sections:

1. Section 01 8113 - Sustainable Design Requirements.
2. Section 09 5123 - Acoustical Tile Ceilings.
3. Section 26 0500 - Common Work Results For Electrical.
4. Section 26 5600 - Exterior Lighting.
5. Section 26 0923 – Lighting Control Devices: For Programmable Lighting Control Systems, Time-Switches, Additional Photoelectric Relays, Power Relays, and Contactors.

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE) Publications:

1. C62.41 "Surge Voltages in Low-Voltage AC Power Circuits".

C. National Fire Protection Association (NFPA) Publications:

1. NFPA 70 "National Electric Code".
2. NFPA 101 "Life Safety Code®".

D. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors".
2. 486B "Standard for Wire Connectors for Use with Aluminum Conductors".

3. 924 "Emergency Lighting and Power Equipment".

1.3 SUBMITTALS

A. Submit in accordance with Section 26 0500 indicating specified items selected for use in Project with the following supporting data:

1. Product Data: For each fixture type.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved manufacturers:

1. Subject to compliance with requirements, provide the products indicated for each designation shown on the drawings.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Provide positive cam action steel latches and safety lock T-hinges.

E. Fixtures to be provided with internal fusing.

F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
White Surfaces: 85 percent.
Specular Surfaces: 83 percent.
Diffusing Specular Surfaces: 75 percent.
Laminated Silver Metallized Film: 90 percent.

G. Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch minimum, unless otherwise indicated.
   b. UV stabilized.
2. Parabolic-type reflector lens shall have minimum three-inch anodized aluminum cubes except it can be smaller for areas with glare protection requirement.
3. Glass: Annealed crystal glass, unless otherwise indicated.

H. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461E. Provide radio-interference filter Sprague Cat JN-14-16351. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 LIGHTING FIXTURES

A. Fixtures shall generate comply with:

1. Minimum BF: 0.88 unless noted otherwise.
2. Minimum LER: 1.466 unless noted otherwise.

2.4 LED LIGHTING

A. All LEDs used in an LED fixture shall be of proven quality from an established and reputable LED manufacturer.

B. Manufacturer shall utilize an advanced production LED binning process to ensure consistency from fixture to fixture and project to project over time, while ensuring a reliable supply of LEDs from the supplier.

C. LED fixtures shall meet lumen maintenance standards as defined in IESNA LM-80-08.

D. Manufacturer shall provide optical performance, polar diagrams and photometric data in various formats including IES file format in accordance with IESNA LM-79-08.

E. IES data must be available and downloadable from manufacturer's website.

F. Manufacturer shall provide a five (5) year warranty from data of substantial completion.

G. Test shall be performed to verify lumen output, life and color properties, CCT and CRI and shall be tested and measured in accordance with LM-80-08. Lumen depreciation shall be in accordance with LM-80-08. Lumen maintenance projections shall not exceed 6X of the available system-level lumen depreciation test data. The system shall; be rated at L70 for not less than 50,000 hours.

2.5 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:
Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10 year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
4. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

2.7 FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 00 "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2 inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2 inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage.

E. Rod Hangers: 3/16 inch minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.8 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.
3. Colors as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings:

1. Recessed lighting fixtures shall be supported independently from the suspended ceiling system. Number 8 gauge galvanized steel wire or approved type hangers from the overhead building structures shall be provided by ceiling contractor for fixture support.

C. Suspended Fixture Support: As follows:
Pendants and Rods: Where longer than 48 inches brace to limit swinging.
Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

3.2 CONNECTIONS

A. Ground Equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

D. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

E. Louver shall be protected from construction contaminants by polyethylene cover until substantial completion.

****

SECTION 26 53 00
EXIT SIGNS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes exit signs units with battery back-ups or remote fixture mounting for ordinary location use.

1.02 REFERENCES

A. Underwriters Laboratories, Inc. (UL):
   1. UL924 — Standard for Safety of Emergency Lighting and Power Equipment

B. National Fire Prevention Association (NFPA):
   1. NFPA 101 — Life Safety Code

C. National Fire Protection Association (NFPA):
   1. NFPA 70 — National Electrical Code (NEC)

D. Canadian Standards Association (CAS):
   1. CSA C22.2 No.141 — Unit Equipment for Emergency Lighting
   2. CSA C860 — Performance of Internally Lighted Exit signs
   3. CSA C22.1 — Canadian Electrical Code Part I (CEC)

1.03 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Submit manufacturer's descriptive literature and product specifications for each product.
   2. Manufacturer's product drawings.

C. Manufacturer's installation instructions

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Products shall be free of defects in material and workmanship.
B. Furnished products are listed and/or certified by third party agencies as suitable for the intended purpose.

C. All units will be certified that they have been tested prior to shipping.

1.05 WARRANTY

A. Product is warranted free of defects in material and workmanship.

B. Product is warranted to perform the intended function within design limits.

PART 2 – PRODUCTS

2.01 GENERAL

A. Exit signs units shall be UL Listed and/or CSA Certified to
1) UL 924 for USA.
2) C22.2 No 141 and C860 for Canada

B. Exit signs units shall perform self-testing in accordance with NFPA 101 if provided. This shall not be regulated in Canada.

2.02 MANUFACTURERS

A. Acceptable Manufacturers:
CSI PLPSOCAL
626-482-8420

Product: EDGELITE EXIT SIGN DUAL LITE – LES SERIES

Or Equal

2.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. LES Series (AC only, AC/DC and self-powered):
1. The unit shall be NEMA 4X rated, with weather and corrosion-resistant.
2. Extruded aluminum construction.
3. The unit shall be available in single or double face in red or green color.
4. The LED light panel uses only 2 Watts of energy, has a 20 year expected lamp life, and superior, red, even illumination.
5. AC exit signs shall be either 120V or 277V.
6. AC/DC exit signs shall be either 120VAC or 277VAC, and 6, 12 or 24VDC.
7. Self-powered exit signs shall be 120/277V.
8. AC input for the normally-on circuit shall be 120/277V, 60 Hz, 0.025/0.12A, 30 W.
9. AC input for LED shall be 120/277V, 60 Hz, 2 W.
10. Battery output shall be 6 V fused circuit and warranty battery for 2 year full, 8 years pro-rata
11. The unit charger shall be current limited, temperature compensated, short-circuit protected and reverse polarity protected.
12. The unit shall be available with the following sealed maintenance-free battery:
13. a. Nickel-Cadmium
14. The unit shall be furnished with an electronic lockout circuit which will connect the battery when the AC circuit is activated, and an electronic brownout circuit which will activate the unit when utility power dips below 80-85% of nominal voltage.
15. The unit is available with AC, emergency and Spectron® self-test/self-diagnostic electronics option. Emergency and self-diagnostic models equipped with isolation transformer and fully automatic constant current solid state charger with sealed maintenance-free nickel-cadmium battery. All emergency models with 90-minute run-time. All components mounted inside housing. Includes test switch and AC-on indicator. Transient/surge protection, low voltage disconnect and AC lock-out features included. Battery recharge within UL time standards. Includes pre-stripped AC input pigtail leads.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance to the NEC, CEC and manufacturer's instructions.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of exterior fixtures, poles, and supports. The terms “lighting fixtures,” “fixture” and “luminaire” are used interchangeably.

1.2 RELATED WORK

A. Section 03 3000, CAST-IN-PLACE CONCRETE.

B. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL: General electrical requirements and items that are common to more than one section of Division 26.

C. Section 26 0519, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.

D. Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

E. Section 26 0533, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.

F. Section 26 0543, UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS: Underground handholes and conduits.

G. Section 26 0923, LIGHTING CONTROLS DEVICES: Controls for exterior lighting.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL

1.4 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, and the following requirements:

1. Shop Drawings:

   a. Submit the following information for each type of lighting fixture designated on the LIGHTING FIXTURE SCHEDULE, arranged in order of lighting fixture designation.
   b. Material and construction details, include information on housing and optics system.
   c. Physical dimensions and description.
   d. Wiring schematic and connection diagram.
   e. Installation details.
   f. Energy efficiency data.
   g. Photometric data based on laboratory tests complying with IES Lighting Measurements testing and calculation guides.
   h. Lamp data including lumen output (initial and mean), color rendition index (CRI), rated life (hours), and color temperature (degrees Kelvin).
   i. For LED lighting fixtures, submit US DOE LED Lighting Facts label, and IES L70 rated life.
   j. Submit site plan showing all exterior lighting fixtures with fixture tags consistent with Lighting Fixture Schedule as shown on drawings. The site plan shall show computer generated point–by-point illumination calculations. Include lamp lumen and light loss factors used in calculations.

2. Manuals:

   a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

3. Certifications: Two weeks prior to final inspection, submit the following.

   a. Certification by the Contractor that the exterior lighting systems have been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Association of State Highway and Transportation Officials (AASHTO):

LRFDLTS-17	Structural Supports for Highway Signs, Luminaires and Traffic Signals

C. American Concrete Institute (ACI):

318-14	Building Code Requirements for Structural Concrete

D. American National Standards Institute (ANSI):

H35.1/H35 1M-17	American National Standard Alloy and Temper Designation Systems for Aluminum

E. American Society for Testing and Materials (ASTM):

A123/A123M-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M-16	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
B108/B108M-15	Aluminum-Alloy Permanent Mold Castings
C1089-13	Spun Cast Prestressed Concrete Poles

F. Federal Aviation Administration (FAA):

AC 70/7460-IL-15	Obstruction Lighting and Marking
AC 150/5345-43H-16	Obstruction Lighting Equipment

G. Illuminating Engineering Society of North America (IESNA):

HB-9-00	Lighting Handbook
RP-8-14	Roadway Lighting
LM-52-03	Photometric Measurements of Roadway Sign Installations
LM-72-97(R2010)	Directional Positioning of Photometric Data

LM-79-08	Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products
LM-80-15	Approved Method for Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
TM-15-11	Luminaire Classification System for Outdoor Luminaires

H. National Electrical Manufacturers Association (NEMA):

C136.3-14	For Roadway and Area Lighting Equipment – Luminaire Attachments
C136.17-05(R2010)(S2017)	Roadway and Area Lighting Equipment – Enclosed Side-Mounted Luminaires for Horizontal-Burning High-Intensity-Discharge Lamps – Mechanical Interchangeability of Refractors
ICS 2-00(R2005)	Controllers, Contactors and Overload Relays Rated 600 Volts
ICS 6-93(R2016)	Enclosures

I. National Fire Protection Association (NFPA):

70-17	National Electrical Code (NEC)
101-18	Life Safety Code

J. Underwriters Laboratories, Inc. (UL):

496-17	Lampholders
773-16	Plug-In, Locking Type Photocontrols for Use with Area Lighting
773A-16	Nonindustrial Photoelectric Switches for Lighting Control
1598-08	Luminaires
8750-15	Light Emitting Diode (LED) Equipment for Use in Lighting Products

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide manufacturer's standard provisions for protecting pole finishes during transport, storage, and installation. Do not store poles on ground. Store poles so they are at least 305 mm (12 inches) above ground level and growing vegetation. Do not remove factory-applied pole wrappings until just before installing pole.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Luminaires, materials and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.

2.2 POLES

A. General:

1. Poles shall be as shown on the drawings, and as specified. Finish shall be as specified on the drawings.
2. The pole and arm assembly shall be designed for wind loading of 161 km/hr (100 mph) minimum, as required by wind loading conditions at project site, with an additional 30% gust factor and supporting luminaire(s) and accessories such as shields, banner arms, and banners that have the effective projected areas indicated. The effective projected area of the pole shall be applied at the height of the pole base, as shown on the drawings.
3. Poles shall be anchor-bolt type designed for use with underground supply conductors. Poles shall have handhole having a minimum clear opening of 65 x 125 mm (2.5 x 5 inches). Handhole covers shall be secured by stainless steel captive screws.
4. Provide a steel-grounding stud opposite handhole openings, designed to prevent electrolysis when used with copper wire.
5. Provide a base cover that matches the pole in material and color to conceal the mounting hardware pole-base welds and anchor bolts.
6. Hardware and Accessories: All necessary hardware and specified accessories shall be the product of the pole manufacturer.
7. Provide manufacturer's standard finish, as scheduled on the drawings.

B. Types:

1. Aluminum: Provide round/square/aluminum poles manufactured of corrosion-resistant AA AAH35.1 aluminum alloys conforming to AASHTO LTS-4. Poles shall be seamless extruded or spun seamless type.
2. Steel: Provide /round/square/steel poles having minimum 11-gauge steel with minimum yield/strength of 48,000 psi and hot-dipped galvanized/iron-oxide primed/factory finish. Galvanized steel poles shall comply with ASTM A123 and A153.

2.3 FOUNDATIONS FOR POLES

A. Foundations shall be cast-in-place concrete, having 3000 psi minimum 28-day compressive strength.

B. Foundations shall support the effective projected area of the specified pole, arm(s), luminaire(s), and accessories, such as shields, banner arms, and banners, under wind conditions previously specified in this section.

C. Place concrete in spirally-wrapped treated paper forms for round foundations, and construct forms for square foundations.

D. Rub-finish and round all above-grade concrete edges to approximately 6 mm (0.25-inch) radius.

E. Anchor bolt assemblies and reinforcing of concrete foundations shall be as shown on the drawings. Anchor bolts shall be in a welded cage or properly positioned by the tie wire to stirrups.

F. Prior to concrete pour, install electrode per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

2.4 LUMINAIRES

A. Luminaires shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and driver, and safe cleaning.

B. Illumination distribution patterns, BUG ratings and cutoff types as defined by the IESNA shall be as shown on the drawings.

C. Incorporate drivers in the luminaire housing, except where otherwise shown on the drawings.

D. Lenses shall be frame-mounted, heat-resistant, borosilicate glass, with prismatic refractors, unless otherwise shown on the drawings. Attach the frame to the luminaire housing by hinges or chain. Use heat and aging-resistant, resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. Pre-wire internal components to terminal strips at the factory.

F. Bracket-mounted luminaires shall have leveling provisions and clamp-type adjustable slip-fitters with locking screws.

G. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.

H. Provide manufacturer's standard finish, as scheduled on the drawings. Where indicated on drawings, match finish process and color of pole or support materials. Where indicated on drawings, provide finishes as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

I. Luminaires shall carry factory labels, showing complete, specific lamp and driver information.

2.5 LAMPS

A. Install the proper lamps in every luminaire installed and every existing luminaire relocated or reinstalled as shown on the drawings.

B. Lamps shall be general-service, outdoor lighting types.

C. LED sources shall meet the following requirements:

1. Operating temperature rating shall be between -40 degrees C (-40 degrees F) and 50 degrees C (120 degrees F).

2. Correlated Color Temperature (CCT): 3000K.
3. Color Rendering Index (CRI): $\geq$ 85.
4. The manufacturer shall have performed reliability tests on the LEDs luminaires complying with Illuminating Engineering Society (IES) LM79 for photometric performance and LM80 for lumen maintenance and L70 life.

2.6 LED DRIVERS

A. LED drivers shall meet the following requirements:

1. Drivers shall have a minimum efficiency of 85%.
2. Starting Temperature: -40 degrees C (-40 degrees F).
3. Input Voltage: 120 to 480 (±10%) volt.
4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of “C Low” (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. “C Low” waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.

6. Power Factor (PF): ≥ 0.90.
7. Total Harmonic Distortion (THD): ≤ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

2.7 OBSTRUCTION LIGHTING

A. Refer to Section 26 09 23, LIGHTING CONTROLS DEVICES for control devices.

B. For Buildings:

1. LED type luminaires shall comply with FAA, AC 70/7460-1K, and AC 150/5345-53, and be Type L-810 duplex units with red steady burning light from and LED light source with minimum 50,000-hour lamp life and employing Night Vision Goggles (NVG) friendly technology.
2. Mount the luminaires on galvanized rigid steel pipe masts attached to the roof of the buildings so the luminaires extend 305 mm (12 inches) above the level of the highest item on the building, including items attached to the roof.
3. Locate luminaires in accordance with the applicable FAA Standards.

C. For Smoke Stacks: Luminaires shall be in accordance with the referenced details shown on the drawings. All lamps shall be the type shown on the drawings.

D. For Water Tanks and Cooling Towers: Luminaires shall be FAA, AC 70/7460-1K, and AC 150/5345-53, Type L-810 duplex units with incandescent or LED light source.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

B. Pole Foundations:

1. Excavate only as necessary to provide sufficient working clearance for installation of forms and proper use of tamper to the full depth of the excavation. Prevent surface water from flowing into the excavation. Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath, and the end of conduit.

2. Set anchor bolts according to anchor-bolt templates furnished by the pole manufacturer.
3. Install poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location.
4. After the poles have been installed, shimmed, and plumbed, grout the spaces between the pole bases and the concrete base with non-shrink concrete grout material. Provide a plastic or copper tube, of not less than 9 mm (0.375-inch) inside diameter through the grout, tight to the top of the concrete base to prevent moisture weeping from the interior of the pole.

C. Install lamps in each luminaire.

D. Adjust luminaires that require field adjustment or aiming.

3.2 GROUNDING

A. Ground noncurrent-carrying parts of equipment, including metal poles, luminaires, mounting arms, brackets, and metallic enclosures, as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially-treated or lined connectors suitable and listed for this purpose.

3.3 ACCEPTANCE CHECKS AND TESTS

A. Verify operation after installing luminaires and energizing circuits.

3.4 WATER TANKS AND COOLING TOWERS

A. Mount the luminaires at the extreme top of tank and tower as shown on drawings.

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DIVISION 27

COMMUNICATIONS

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not necessarily limited to:

1. Common standards and procedures for the Communications Work.

   a. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Work of this Division. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.

B. Provisions of this Section apply to Communications Work, including the following Sections:

1. Section 27 0526 - Grounding and Bonding for Communications Systems
2. Section 27 0529 - Hangers and Supports for Communications Systems
3. Section 27 0533 - Conduits and Backboxes for Communications Systems
4. Section 27 0536 - Cable Trays for Communications Systems
5. Section 27 0539 - Surface Raceway for Communications Systems
6. Section 27 0553 - Identification for Communications Systems
7. Section 27 1000 - Structured Cabling, Basic Materials and Methods
8. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures
9. Section 27 1119 - Communications Termination Blocks and Patch Panels
10. Section 27 1123 - Communications Cable Management
11. Section 27 1300 - Communications Interior Backbone Cabling
12. Section 27 1500 - Communications Horizontal Cabling

1.2 REFERENCES

A. Usage: In accordance with Division 1.

B. American National Standards Institute (ANSI)

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009
2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009
3. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, published 2009
4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, published 2018, plus errata issued in October, 2008.
5. TIA-569-C (2012) Telecommunications Pathways and Spaces
6. ANSI/TIA-606-B-2012, Administration Standard Telecommunications Infrastructure.
7. ANSI-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
8. ANSI/TIA-758-A, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

C. BICSI

1. Telecommunications Distribution Methods Manual (TDMM) - 12th edition.
2. BICSI - Outside Plant Design Reference Manual (OSPDRM) - 4th edition.
3. BICSI - Wireless Design Reference Manual (WDRM) - 3rd edition.

1.3 DEFINITIONS

A. See also Division 1.

B. General Abbreviations used in these specifications. Refer additionally to the abbreviations list appearing on the Drawings.

1.	ADA	Americans With Disabilities Act.
2.	AFC	Above Finished Ceiling.
3.	AFF	Above the Finished Floor.
4.	BLDG	Building
5.	CAT	Category
6.	CL	Centerline
7.	DIV	Division
8.	(E)	Existing
9.	FBD	Furnished By Owner
10.	HR	Home Run
11.	ID	Inside Diameter
12.	LAN	Local Area Network
13.	MAX	Maximum
14.	NIC	Not In Contract.

15. OD Outside Diameter
16. PSRH Project Standard Receptacle Height.
17. PSSH Project Standard Switch Height.
18. TYP Typical
19. OFE Owner Furnished Equipment.
20. UON Unless Otherwise Noted.

C. Electrical and electronics terms used in the Communications Sections shall be as defined in:

1. ANSI/TIA-568-C.0
2. ANSI/TIA-568-C.1
3. ANSI/TIA-568-C.2
4. ANSI/TIA-568-C.3
5. ANSI/TIA-569-C
6. ANSI/TIA-606-B
7. IEEE Std 100
8. This Section.

D. Main Distribution Facility (MDF): Is a campus serving facility. The MDF is the room within a building for telecommunications equipment that meets the voice, data, video, radio, and wireless needs of its building and also serves other buildings on campus. It generally acts as an EF and BDF but can also act as an IDF serving the floor it occupies.

E. Intermediate Distribution Facility (IDF) - A distributor used to connect horizontal cable and cabling subsystems or equipment.

F. Telecommunications Room (TR) - The term TR refers to space allocated within a building to provide a secure operating environment for telecommunications cabling and termination facilities and/or network equipment. TRs shall be designed and provisioned per

ANSI/TIA-569-C 5. Telecommunications Pathways and Spaces and per the BICSI Telecommunications Distribution Methods Manual (TDMM), most recent edition. Depending on the building size, design, and network requirements, one or more of the functions of a TR may be combined into one space. The primary functions housed in TR's are:

1. Entrance Facility (EF).
2. Intermediate Distribution Frame (IDF).
3. Main Distribution Frame (MDF).

G. Entrance Facility (EF) (Telecommunications) Is a room that houses the termination and grounding point of OSP network service cables that enter or exit a building. It enables the joining of intra-building and inter-building

backbone cabling. The EF is generally co-located in a BDF or MDF rather than being a separate room

H. Entrance Room (ER) (Telecommunications) - A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

I. Open Cable - Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is open to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.

J. Open Office - A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.

K. Pathway - A physical infrastructure utilized for the placement and routing of telecommunications cable.

L. Reference to Named Products

1. Selected Item: Item so noted was selected based on comparative testing of similar products. Procedure for determination of equivalence is noted in the specification for the item(s).
2. System Design Basis: Item so noted interacts with other system items to produce total system function. Substitution of this item may require coordinated substitution of other system items.
3. Design Basis: Item so noted was used as basis for system drawings to establish features, size, etc. Use of specified equivalents may require adjustment of physical layout or wiring, but does not affect system function. No preference is implied.

1.4 SUBMITTALS

A. Comply with Division 1 and the following.

1. Submit all materials for review arranged in same order as Specifications, individually referenced to Specification Section, Paragraph and Contract Drawing number. Confirm in every detail as applies to each referencing Section.
2. Submit 8 ½"x 11" items bound in volumes and drawings in edge bound sets. Submit all drawings on sheets of the same size.
3. Make each specified submittal as a coordinated package complete with all information specified herein. Incomplete or uncoordinated submittals will be returned with no review action.
4. Progress Schedule: Comply with Division 1.

B. Contractor and Key Personnel Experience.

1. A minimum of 30 days prior to installation, submit documentation of the experience of the low voltage systems, equipment and infrastructure contractor(s) and of their key personnel.
2. Qualifications shall be provided for:
   a. the low voltage systems, equipment and infrastructure contractor(s),
   b. the low voltage systems, equipment and infrastructure installers,
   c. and the supervisor(s) (if different from the installers).
3. A copy of the Contractor's C-7 license or C-10 licenses - both if Contractor has both.
4. A copy of testing personnel certification(s)that demonstrate that the proposed personnel have the necessary training and certifications to conform with the proof of performance testing requirements of this Division and that they are properly trained in the use of the testing equipment that will be employed by the contractor.
5. Copies of Contractor's Structured Cabling System (SCS) manufacturer's authorized vendor/installer Certification document(s).
6. Refer to Quality Assurance paragraph in this section for complete requirements.

C. Manufacturer's Product Data:

1. Manufacturer's Product Data Sheets. Collate in sequence of List of Materials:
2. Data sheet for each item in each Communications Section, including all accessories, clearly marked for proposed product.
3. Material Safety Data Sheet, where applies.
4. List of Materials Schedule. For each item, include:
   a. Referencing Specification Section
   b. Referencing Paragraph
   c. Referencing Drawing, if specified only on plan
   d. Manufacturer.
   e. Model number.
   f. Listing, including name of Nationally Recognized Testing Laboratory.
   g. Precede each submittal book with a summary schedule, with columns for each item above and rows for each item submitted, per the example schedule below:

Specification Section	Paragraph	Contract Drawing Reference	Manufacturer	Model No.	UL/ETL/CLA Listed
27 05 00	2.03C		XYZ	123	Y
27 15 00	2.07A1		AAA	34-56	Y
		T0.1	ZZY	456	Y

D. Field (Installation) Drawings:

1. General

   a. Drawings shall present the proposed installation using the makes and models of devices proposed for use this project; replace vendor neutral nomenclature used in bid set with the actual part numbers to be installed or provide a lookup table in the drawings to permit determining the actual part number.
   b. Where the existing systems and/or infrastructure are used and integrated into the work of the project, indicate them on drawings, including points of interface and demarcation of existing and new work.
   c. Collate, in sequence, at least the following minimum drawings, for each infrastructure and system to be installed under the work of this contract:

2. Drawing index/symbol sheet.
3. Site plans, floor plans and reflected ceiling plans.

   a. General

      1) The identifier for each termination and cable shall appear on the drawings, either directly on the floor plans, through an associated schedule or a unique identifier associated with a fully annotated single line diagram.
      2) Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
      3) At scale of Contract Documents, show:

         a) Device locations and type
         b) Rough-in.
         c) Mounting height.
         d) Conduit size.

e) J-hook routes
f) Wire type.
g) Wire fill.

4) On the floor plans, indicate floor and wall mounted devices and pathway below a height of 7 feet above finish floor. Indicate the locations of the communications rooms and provide reference to the enlarged communications rooms plans.
5) On the reflected ceiling plan, indicate ceiling and wall mounted devices and pathway above a height of 7 feet above finish floor.Indicate the locations of the communications rooms and provide reference to the enlarged communications rooms plans.

b. Communications Infrastructure

1) Provide registered communications distribution designer (RCDD) approved, drawings depicting a complete communication infrastructure in accordance with ANSI/TIA-606-B. The drawings should provide details required to prove that the distribution system shall properly support connectivity from the communications

rooms including EF, ER, CD's, BD's, and FD's to the telecommunications work area outlets.
2) The following drawings shall be provided as a minimum:

a) T1- Layout of complete building per floor - Building Area/Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways. Layout of complete building per floor. The drawing indicates location of building areas, serving zones, vertical backbone diagrams, telecommunications rooms, access points, pathways, grounding system, and other systems that need to be viewed from the complete building perspective.
b) T-2 Serving Zones/Building Area Drawings - Drop Locations and Cable Identification (ID'S). Shows a building area or serving zone. These drawings show drop locations, telecommunications rooms, access points and detail call outs for common equipment rooms and other congested areas.
c) A complete jack numbered plan set in FUSD jack numbering format in printed and AutoCAD format. Number plans with all jacks for each floor indicated on a single drawing sheet. Data, voice, wireless and security jacks shall appear on the same page. Symbols shall be indicated for the data, wall phone, wireless, inside camera, outside camera, as applies. A four digit jack numbers shall be

printed by each jack symbol. Jack plan shall be approved by the Owner before the cabling begins.

4. Enlarged Plans

   a. General

      1) Indicate at least as much information as is provided in the Contract Documents, supplemented by the dimensions and arrangement of the proposed equipment, trade coordination and field conditions.

   b. Communications Infrastructure.

      1) Communications Rooms Drawings

         a) Provide T3 drawings in accordance with ANSI/TIA-606-B that include telecommunications rooms plan views, pathway layout (cable tray, racks, ladder-racks, etc.), mechanical/electrical layout, and cabinet, rack, backboard and wall elevations. Include rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation.

         b) At scale of Contract Documents, the Contractor shall submit scaled drawing elevations (showing dimensions, mounting locations and associated frames & equipment) for all required assemblies, including but not limited to:

            (1) Rack locations
            (2) Wall mounted plywood backboards
            (3) Wall mounted backbone cabling and major station cable bundles.
            (4) Wall mounted and tray mounted splice cases
            (5) Wall mounted copper cable protectors and terminal blocks.
            (6) Wall mounted fiber optic cable terminations.
            (7) Clearances
            (8) Backboard Wire and Cable Management
            (9) Rack elevations, including
            (10) Copper cable patch panels.
            (11) Fiber optic cable patch panels.
            (12) Rack mounted wire managers
            (13) Hold clears for equipment provided by Others.
            (14) Reference to mounting details.
            (15) Power strips
            (16) UPS

2) Drawings may also be an enlargement of a congested area of T1 or T2 drawings.

5. System Conduit and Riser Diagrams,

a. General:

1) Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.
2) Single line diagram of structured wiring
3) Grounding and bonding scheme
4) Terminal cabinets.
5) Coordination with floor plans.
6) Wire runs not shown on floor plans.
7) Wire type.
8) Wire fill.
9) Interface to work provided by work of other Sections, Owner Furnished Equipment, existing equipment and/or future equipment.

6. Detail Drawings

a. Mounting details:

1) Conform with Walnut Valley Water District approved mounting details provided in the Contract Documents.

b. Faceplate and Receptacles

1) Receptacle and jack arrangement for each condition.
2) Labeling of receptacle/jacks and plate
3) Plate material.
4) Plate finish.
5) Connector types.
6) Connector dimensioned layout.

c. Pathway

1) Cable tray installation details, indicating complete system of fittings and radiused pathways provided.
2) Firestopping. Listed fire stop system documentation supporting proposed systems ability to conform with the project requirements.
3) Penetrations. All conduit and piping wall, ceiling, floor, and roof penetrations, including both fire rated or non-rated, should be submitted for review prior to installation.

a) For cored penetrations through concrete partitions, submit proposed work plan in the form of Coring/Saw cutting summary Description as described in Section 27 05 33 - Conduits and Backboxes for Communications Systems.

4) Details of flexible raceway connections to be made to vibrating equipment
5) Details of J-Box and sealant application for the typical conditions listed in Section 27 05 48 - Noise and Vibration Controls for Communications System, and a schedule of rooms to receive application of mastic and sealant at J-Boxes
6) An itemized list of all items of equipment to be fitted with flexible electrical connections.
7) Conduit racking details.

d. California Access Compliance Manual and Americans with Disabilities Act (ADA) compliance.
e. Terminal cabinets: Terminations.

E. Schedule Submittals.

1. An Excel spreadsheet listing jack number, floor number, room number and jack type (workstation, wireless, camera, emergency phone, etc.)
2. Voice cable plant: Cut sheets for use by Owner's Telephone Systems Contractor.

F. Samples

1. Mock-ups of each type of communications outlet faceplate to be furnished for this project. Each faceplate mock-up shall contain the following:

a. Full load of required connectors with eighteen inches (18") of connector type appropriate specified cable terminated on each connector.
b. Required faceplate labeling to include faceplate icons as required by these Division 27 Specifications and the accompanying construction drawing set.

G. Cabling and Equipment Test Plan

1. Submit complete documentation of the proposed test plan and equipment to be used to document that the performance of the cabling, equipment, sub-systems and complete systems installed under the work of this project conform with the performance standards outlined in each specification section.

2. Submit not less than 45 days prior to the proposed test date. Include procedures for certification, validation, and testing.
3. Submit manufacturer's or recognized national test laboratory's calibration certificate one
(1) month before any post-installation testing begins. Date on test unit calibration certificate shall be no longer than one (1) year prior to the date that post-installation testing is scheduled to begin.
4. Submit a copy of the Test Equipment manufacturer's recommended testing procedure for each of the structured cabling system elements listed above in this section.

H. Test Reports

1. Manufacturer's Field Reports

   a. Factory reel tests

2. Project Site Test Reports:

   a. Submit following system completion and prior to and as condition precedent to Acceptance Review and Testing of the Work of this Section.
   b. Schedule: Submit test reports in timely manner relative to Project schedule such that the Owner's Representative may conduct verification of submitted test data without delay of scheduled progress.
   c. Provide test reports as specified within each section of Division 27 requiring performance testing.
   d. Content: Include at least:

      1) Time and date of test.
      2) Personnel conducting test.
      3) Test equipment, including serial and date of calibration.
      4) Test object.
      5) Procedure used.
      6) Results of test
      7) Numerical or graphical presentation.

   e. Submit copy of final results on paper and in electronic form, organized by circuit number, consistent with circuit numbering scheme used in preparing submittal drawings and in labeling receptacles and terminations.

      1) Submit machine-generated documentation and raw data of all test results in electronic form on CD-R media
      2) Where the electronic documentation requires use of a proprietary computer program to view the data, provide the

Owner with 1 licensed copy of the software.

1.5 QUALITY ASSURANCE

A. Procedures: In accordance with Section 01 43 00 - Quality Assurance.

B. Designated Supervisor: Provide a designated supervisor present and in responsible charge in the fabrication shop and on the Project Site during all phases of installation and testing of the Work of this Section. This supervisor shall be the same individual through the execution of the Work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.

C. Reference Documents: At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies.

   1. A complete set of the latest stamped, actioned submittals of record.
   2. A complete set of manufacturer's original operation, instruction and service manuals for each equipment item.

D. Standard Products

   1. Telecommunications Equipment. Provide telecommunications materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 1 year prior to bid opening. The 1-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 1-year period.

      a. Alternative Qualifications. Products having less than a 1-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 4000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

   2. Material and Equipment Manufacturing Date

      a. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

E. Test Equipment

   1. Requirements:

a. Maintain and operate test equipment at the fabrication shop and the job site for both routine and Acceptance Testing of the Work of this Section.
b. Maintain test equipment at the job site while work is in progress from installation of equipment racks until Owner's Acceptance of this Work; thereafter remove all of this test equipment from the job site.
c. Unless otherwise indicated, test equipment shall remain property of the Contractor.
d. Provide all required test cables, jigs and adapters.
e. Provide equipment with traceable calibration, with calibration date not greater than one year prior to the date of the use of the equipment to perform the specified testing.

F. Qualifications

1. Key Personnel, General

a. Indicate the proposed key persons that are currently employed by the telecommunications contractor or who have a commitment to the low voltage systems and infrastructure contractor for the work of this project. All key persons shall be employed by the low voltage systems and infrastructure contractor at the date of issuance of this project, or if not, have a commitment to the low voltage systems and infrastructure contractor to work on this project by the date that the bid was due to the Owner’s Representative.
b. Note that only the key personnel approved by the Owner’s Representative in the successful proposal shall perform work on this project's low voltage systems and infrastructure systems. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the low voltage systems and infrastructure contractor's key personnel requires approval from the Owner’s Representative.

2. Telecommunications Contractor

a. The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment.

1) The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems
2) Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the

telecommunications contractor.

b. Key Personnel

1) Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this project depending upon how many of the key roles each has successfully provided. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems
2) Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel.
3) In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have of experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this project. Include specific experience in installing and testing telecommunications systems and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this project. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity

3. Minimum Communications Infrastructure Manufacturer Qualifications

a. Cabling, equipment and hardware manufacturers shall have a

experience in the manufacturing, assembly, and factory testing of components which comply with ANSI/TIA-568-C.1, ANSI/TIA-568-C.2 and ANSI/TIA-568-C.3.

1.6 REGULATORY REQUIREMENTS

A. Regulations Applicable: Including but not limited to those defined in Division 1.

1. Nothing in the Contract Documents shall be construed to permit Work not conforming to applicable laws, ordinances, rules, or regulations.
2. Safety Agency Listing: All devices provided under the Work of this Section which are connected to the Project electrical system shall be listed by a Nationally Recognized Testing Laboratory, and shall be so labeled.
3. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Owner's Representative. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.7 DELIVERY, STORAGE AND HANDLING

A. Procedures:

1. In accordance with Division 1, as specified in the individual sections of Division 27 and the following.

B. General

1. Protect materials and equipment from damage during delivery, storage, handling and throughout the staging and construction periods. Equipment and materials shall be

   protected against physical damage, dirt, theft, sun, moisture (including surface water and precipitation) and extreme temperature.
2. The top and bottom ends of all cable shall be available for testing. When not being prepared for testing, both ends of each cable shall be sealed to prevent the ingress of moisture.
3. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.
4. Do not deliver or install equipment frames and cable trays until spaces

are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.

5. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum-cleaned both inside (as appropriate) and outside before testing, operating or painting.
6. As determined by the Owner's Representative, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents. The decision of the Owner's Representative shall be final.
7. Painted surfaces shall be protected with removable heavy kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.
8. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with same quality of paint and workmanship as used by manufacturer.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, non-condensing.

1.9 SEQUENCING

A. Not Used.

1.10 OPERATING AND MAINTENANCE DATA

A. Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the communications cabling and systems. Precede the manuals with a systems narrative specific to this Project, outlining the major systems functionality, the major systems components, and identifying which manuals document the performance of which subsystems.

1. Submit operations and maintenance data in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals and as specified herein not later than 2 weeks prior to the date of beneficial occupancy or as specified in Division 1, whichever is sooner.

1.11 PROJECT RECORD DOCUMENTS

A. Comply with Section 01 77 00 - Closeout Procedures, Section 01 78 00

Closeout Submittals, and the following. Include at least as much information as required for the submittal drawings.

1. Record Drawings

    a. CAD.

        1) Use a computer aided drafting (CAD) system in the preparation of record drawings for this Project. CAD system shall produce files in AutoCAD® .DWG format, version 2004 or later.

    b. Except where prohibited by Contract, Owner will furnish CAD backgrounds in AutoCAD® .DWG format, for use by the Contractor in preparing Record Drawings.
    c. Contractor shall be responsible for updating building and communications plans to reflect as-built conditions.

        1) Indicate actual work on Drawings; indicate actual products used, replace vendor neutral nomenclature used in bid set with makes and models of actual installed devices.
    d. Disk copy of Record Drawings: Two (2) sets of CDs or DVDs of the as-built drawings.
    e. Reproduceable: As required by Division 1

2. Provide T5 drawings including documentation on cables and termination hardware in accordance with ANSI/TIA-606-B. T5 drawings shall include schedules to show information for cut-overs and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. Provide the following T5 drawing documentation as a minimum:

    a. Cables - A record of installed cable shall be provided in accordance with ANSI/TIA-606-B. The cable records shall include the required data fields for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility in accordance with ANSI/TIA-606-B. Include manufacture date of cable with submittal.
    b. Termination Hardware - A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be provided in accordance with ANSI/TIA-606-B. Documentation shall include the required data fields as a minimum in accordance with ANSI/TIA-606-B.
    c. The list of minimum required Project Record drawings is as follows:

1) All cabling outlets with IDs for each connector on the faceplate;

(a) Two inch (2”) and larger conduit pathways to include conduit size label;
(b) Pull box locations;
(c) Two inch (2”) & four inch (4”) J hook runs indicated by a line series of “x”s;
(d) Telecom room layout labeled per current construction drawing field mark-ups;
(e) Rack elevation labeled per current construction drawing field mark-ups;
(f) Backbone copper and fiber schematic drawings with labeling information

3. Record of Cable Plant Test

a. Two (2) sets of CDs or DVDs of final Owner accepted cable plant testing results documentation.
b. Provide at least a copy of software with at least 1 user license if required to view submitted test data.

4. Penetrations

a. All penetrations provided under the work of the project, including fire rated and none fire rated.

5. Fire stopping

a. Two (2) sets of CDs or DVDs of all fire stop graphical UL fire resistance manual reference drawings and supporting text.

6. Spare Parts

a. In addition to the requirements of Section 01 77 00 - Closeout Procedures, provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

1.12 WARRANTY SERVICE

A. In addition to provisions of Division 1, provide the following.

1. Response Time: Provide a qualified technician familiar with the work at the Project Site within 24 hours after receipt of a notice of malfunction. Provide the Owner’s Representative with telephone number attended 8 hours a day, 5 days a week, to be called in the event of a malfunction.

B. The Contractor shall provide a one (1) year material and labor warranty on all the work the Contractor has performed.

C. The Contractor shall provide the Structured Cabling System (SCS) manufacturer's materials and link performance certification warranty for all new cable installed by the Contractor in his execution of the work of this specification.

D. Provide all additional Warranties as defined in each Communication Systems Section.

1.13 ACCEPTANCE REVIEW AND TESTING PROCEDURES

A. Complete all Work of this Section. Submit Test Report. Submit review copies of Operating and Maintenance Manuals, less reduced set of Record Drawings. Notify the Owner's Representative in writing that the Work of these Sections is complete and fully complies with the Contract Documents. Request Acceptance Review and Testing. The Owner's Representative will conduct Verification of Submitted Test Data, and otherwise direct testing and adjustment of this Work. These procedures may be performed at any hour of the day or night as required by the Owner's Representative to comply with the Project Schedule and avoid conflict with Residents. Provide all specified personnel and equipment at any time without claim for additional cost or time.

B. Personnel: Provide services of the designated supervisor and additional technicians familiar with work of this Section. Provide quantity of technicians as required to comply with Project Schedule.

C. In Addition, Provide:

1. All tools appropriate for performance of adjustment of and corrections to this Work. Include spare wire and connectors and specified tooling for application.
2. Ladders, scaffolding and/or lifts as required to access high devices.
3. All test equipment.
4. Complete set of latest stamped, actioned submittals of record for reference.
5. Complete set of Test Reports.
6. Complete set of manufacturer's original operation, instruction and service manuals for each equipment item for reference.
7. Demonstrate: Complete operation of all systems and equipment, including Portable Equipment.
8. Adjust: As directed by the Owner's Representative.
9. Correct: In timely manner, failure to comply with the Contract

Documents, as reasonably determined by the Owner's Representative.

D. Temporary Equipment: Provide and operate, without claim for additional cost or time, temporary equipment and/or systems to provide reasonably equivalent function, as determined by the Owner's Representative, in place of the Work of this Section which is incomplete or found not in conformance with the Contract Documents as of seven (7) days prior to the scheduled completion date. Provide such temporary equipment until Acceptance of the Work of this Section. Thereafter, remove such temporary equipment.

1.14 CLOSEOUT

A. Punch List: Perform any and all remedial work, at no claim for additional cost or time. Where required, retest and submit Test Report. Notify the Owner's Representative of completion of Punch List.

B. Portable Equipment: Furnish all portable equipment and spares to the Owner's Representative, along with complete documentation of the materials presented. Where applicable, furnish portable equipment in the original manufacturer's packing.

C. Operating and Maintenance Data: Install framed operating and maintenance instructions. Submit Manuals.

D. Project Record Documents: Submit print and digital copies. Digital files shall be in AutoCAD
.dwg format.

E. Keys: If applicable, replace construction locks with permanent locks. Provide 5 sets of keys to the Owner's Representative.

F. Instruction: Conduct specified instruction.

G. Warranty: Submit Warranty dated to run from date of Acceptance of the Work of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.

B. Each material, device or piece of equipment shall comply with all of the manufacturer's current published specifications for that item.

C. Products shall be made by manufacturers regularly engaged in the production of such products.

D. Provide quantity as shown on Contract Drawings, or as otherwise indicated.

E. Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section as if specified in full herein.

F. Unless recycled content is specified, provide new materials.

G. Provide the manufacturer's latest design/model, permanently labeled with the manufacturer's name, model number and serial number.

H. Where products are of similar type or use, provide products of the same manufacturer, unless otherwise indicated. When more than one unit of the same type of equipment or material is required, such units shall be the products of a single manufacturer and part number.

I. Components

1. UL or third party certified. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.
2. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance.

    a. The label or listing by the specified organization will be acceptable evidence of compliance.
    b. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner’s Representative.
    c. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

J. Enclosures:

1. Provide steel frames and enclosures designed and wired to eliminate all induced currents.

2. Make bolted connections with self-locking devices.

K. Finishes: Any item or component of the Work of this Section which is visible shall comply with the following.

1. Finishes noted or scheduled on the Contract Drawings take precedence.
2. Where design location requires that products, materials or equipment are visible to the public, no manufacturer's logos larger than 1/2 inch shall be visible. Unless otherwise noted or directed, neatly remove or permanently paint out such logos.
3. Where finishes are not noted or otherwise defined in the Contract Documents, submit manufacturer's standard finish samples for selection by the Owner’s Representative.

PART 3 - EXECUTION

3.1 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Contractor shall keep on the Project site a copy of the Specifications and Drawings, and the same shall be available at all reasonable times for inspection and use by The Owner's Representative and by any other person authorized by The Owner's Representative. Any Drawings listed in the detail Specifications shall be regarded as a part thereof and of the Contract. Anything mentioned in these Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in these Specifications, shall be of like effect as though shown or mentioned in both.

B. It shall be the duty of Contractor to see that the provisions of these Specifications are complied with in detail irrespective of the inspection given the work during its progress by The Owner's Representative. Any failure on the part of Contractor to observe the Specifications will be sufficient cause for the rejection of the work at any time before its acceptance.

C. The drawings use symbols and schematic diagrams to indicate the scope of work. These symbols and diagrams will not typically identify dimensions nor will they identify inclusion of specific accessories, appurtenances and related items necessary and appropriate for a complete and proper installation and operation. The Contractor shall install work complete and ready for proper operation, including related items not specifically identified, shown, indicated or specified. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and in conformity with the dimensions indicated on architectural drawings and on shop drawings approved by the Owner’s Representative.

D. The drawings include some details for various items, which are specific

with regard to the dimensions and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work. Work shall not proceed until actual field conditions and requirements are verified by the Contractor.

E. The Owner's Representative will furnish from time to time, such detail drawings, drawings, profiles, and information as The Owner's Representative may consider necessary for Contractor's guidance to insure the proper and adequate execution of the Contract. Contractor shall comply with such detail drawings, drawings, profiles and information.

F. In accordance with the requirements of Division 1, only shop drawings and submittals have been received a review of "No Exceptions Taken" or "Make Corrections As Noted" shall be used in construction.

G. Contractor shall not scale the Contract Document set to determine exact dimensions or exact location. Scaled drawings are to be considered diagrammatic. If exact lengths or location placement dimensions are required, the drawings will specifically show those dimensions or placement coordinates.

3.2 INSTALLATION

A. The Contractor shall furnish all required materials, equipment, and tools necessary to properly complete the work of these specifications including, but not limited to, tools for pulling and terminating the cables, mounting hardware, cable ties, bolts, anchors, clamps, hangers, kits of consumables, lubricants, technician communication devices, cable testing equipment, stands for cable reels, cable wenches, etc.

3.3 EXAMINATION

A. The Contractor is responsible for examining existing conditions and comparing them with drawings and specifications and notifying the Owner Representative or his/her designate of any discrepancies.

B. The Contractor is responsible for coordinating with the Owner Representative or his/her designate to address, adjust, and resolve any discrepancies found before commencing work.

C. If a discrepancy between existing conditions and the Contract drawings and specifications are found after commencing work, stop any work that in the Contractor's opinion is affected by the found discrepancy. The contractor shall submit an RFI requesting information on how to resolve the

discrepancy. The RFI shall also contain a possible solution, before commencing work in work areas affected by the discrepancy.

3.4 PREPARATION

A. Prepare and sequence the work to minimize disruption to each room environment and existing communications systems.

B. The Contractor shall follow all rules, regulations, and instructions in this specification, general provisions of the Contract, including General and Supplementary Conditions, and Division 1 specification sections, if issued in conjunction with these Division 27 specifications with regard to the following:

1. Delivery hours.
2. Delivery locations.
3. Storage.
4. Hazardous Material.
5. Security
6. Safety.
7. Logistics.

C. The Contractor shall coordinate their work so there shall be no disruption to any occupants of a FUSD campus unless coordinated and approved by the Owner's Representative. Any necessary disruption shall be scheduled a minimum of 2 weeks in advance of its occurrence and affected parties shall be notified in writing of date, time, and planned duration of the disruption.

D. Protection:

1. When work is being done in or adjacent to occupied spaces, the Contractor shall protect the occupied spaces from dust, trash and debris through the use of barriers and/or other devices
2. When working in occupied spaces, cover all computers, electronic equipment, desks, chairs, furniture and other articles when working at ceiling level and/or performing dust producing tasks.
3. At no time shall the Contractor use Owner property including but not limited to the Owner's furniture, loose equipment or supplies located in occupied spaces in the course of installing the work of this project.

3.5 CLEANING

A. When working in spaces not currently occupied by the Owner's personnel during ordinary work week:

1. Work areas shall be left broom clean at the end of each work day. This includes the removal of packing material, trash and debris caused by the work.

B. Where working in spaces occupied by the Owner:

1. Immediately after completing work within each space, clean up and remove all materials, scrap and dust.
2. Surfaces exposed to dust either during the installation or following removal of protection systems as specified herein above shall be cleaned to their original state daily prior to the return of the occupants to the space.
3. All dust resulting from work performed shall be vacuumed up daily prior to the return of the occupants to the space.

C. Disposal
1. All scrap material in work area shall be picked up and removed from the building at the end of each day..
2. See Division 1 for additional requirements and project procedures for waste disposal and recycling requirements that apply to this project.

3.6 REPAIR AND RESTORATION

A. Where working in spaces occupied by the Owner, return to their original positions any furniture or articles relocated to perform the work.

3.7 VERIFICATION

A. The Contractor shall verify that the installation and materials used have been inspected before they are enclosed within building features, or otherwise hidden from view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected and approved.

B. The Contractor shall verify that requirements of this specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.

1. Verification by Inspection. Verification by inspection includes the examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the Owner.

C. Verification by Test and Demonstration. The Contractor shall verify by formal demonstrations or tests that the requirements of this specification have been met. The Contractor shall demonstrate that the communications systems components and subsystems meet specification requirements in the "as-installed" operating environment during the System Operation Test. Even though no formal environmental testing is required, the Contractor shall measure and record temperature, humidity and other environmental parameters and the environmental conditions, which were encountered during the System Operation Test.

3.8 COMMISSIONING AND ACCEPTANCE

A. General:

1. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.

B. Results Expected:

1. Communications Infrastructure Systems shall be complete and ready for use.
2. Testing, start-up and cleaning work shall be complete.
3. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Owner.

C. Inspections

1. There shall be three phases of commissioning inspections:

   a. Rough-in inspection
   b. Above-ceiling inspection (after cables are placed)
   c. Final inspection and testing

2. The Contractor shall verify that the installation and materials used have been inspected before they are enclosed within building features, or otherwise hidden from view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected and approved.

D. Rough-in inspection. Once electrical rough-in and pathways have been installed, but prior to walls and ceilings being installed, the Contractor shall request the design team, in writing, for the official rough-in inspection to take place. The Owner’s Representative will then schedule a time to be on-site to conduct this inspection.

1. At a minimum, the Owner's Representative will evaluate the following items:

    a. Accurate location and height above finished floor for all outlet boxes.
    b. Accurate dimensions (particularly depth) of all outlet boxes and diameter of in-wall conduit serving outlet boxes.
    c. Cable tray size, location, and clearance.
    d. Location and size of all other communications conduits or pathways.
    e. Location, spacing and clearance of and around racks and wall-mounted equipment.
    f. That communications room power receptacles, where installed under the work of this project, meet the design requirements.

2. The Owner's Representative is then to issue a written report to the Contractor identifying all items which currently do not meet the construction document requirements. All items are to be resolved prior to walls and ceilings being closed up. This report is not necessarily all-inclusive; should issues be discovered later in the project, the Contractor is still responsible for corrections/repairs.

E. Above-ceiling inspection

1. Once all communication cabling has been installed and properly supported and walls have been painted, but prior to the installation of ceiling tiles/material, contractor shall request of the design team, in writing, for the official above-ceiling inspection. The Owner's Representative will then schedule a time to be on-site to conduct this inspection.

2. At a minimum, the Owner's Representative will evaluate the following items:

    a. That all items from the previous inspection have been corrected.
    b. That communications cabling is routed correctly and adequately supported.
    c. That communications cabling is not painted or over-sprayed.
    d. That the installed communications cabling matches what was specified/submitted.
    e. That there are no kinks, splices, or other damage to the installed communications cabling.
    f. That all cables and WAOs are properly labeled.
    g. That all penetrations through fire-rated walls are properly fire stopped, including fire blocking materials installed in the annular spaces; and that the firestops are properly labeled.

3. The Owner's Representative is then to issue a written report to the

Contractor identifying all items which currently do not meet the construction document requirements. This report is not necessarily all-inclusive; should issues be discovered later in the project, the appropriate communications subcontractor is still responsible for corrections/repairs.

F. Final inspection.

1. Once all communications work has been completed, contractor shall request of the Owner's Representative, in writing, the official final inspection. This request shall be made 3 weeks before substantial completion. The Owner's Representative will then schedule a time to be on-site to conduct this inspection.
2. At a minimum, the Owner's Representative will check the following items:

    a. That all items from the previous inspections have been corrected.
    b. That all faceplates are installed, with the correct modules, quantity of modules, and approved labeling scheme.
    c. That all equipment and cabling within communications rooms is installed per the contract documents, including all patch panels and wall blocks (with specified spare capacity), horizontal and backbone cabling labeling, and telecommunications grounding.
    d. And all other items necessary to guarantee contract documents are met and complete and functioning communications systems are installed.
    e. That all cables and WAOs are properly labeled.
    f. That all penetrations through fire-rated walls are properly fire stopped, including fire blocking materials installed in the annular spaces; and that the firestops are properly labeled.

3. The Contractor shall provide the following for the acceptance testing.

    a. All personnel required for perform the tests. This shall include the site supervisor.
    b. All tools appropriate for performance of adjustment of and corrections to this Work. Include spare wire and connectors and specified tooling for application.
    c. Ladders, scaffolding and/or lifts as required to access high devices.
    d. All test equipment.
    e. Complete set of latest stamped, actioned submittals of record for reference.
    f. Complete set of Test Reports.
    g. Complete set of manufacturer's original operation, instruction and service manuals for each equipment item for reference.

4. The Contractor shall execute the test plan required in the above

Submittals section and as approved and/or modified by the Owner's Representative. The testing must demonstrate complete operation of all systems and equipment, including any portable equipment.

5. These procedures may be performed at any hour of the day or night as required by the Owner's Representative to comply with the Project Schedule and avoid conflict with Residents. Provide all specified personnel and equipment at any time without claim for additional cost or time.
6. After installation, the Contractor shall test, certify and provide required warranties for the Structured Cabling System (SCS) installed per the requirements of this specification.

3.9 ADJUSTMENTS

A. The Contractor is responsible for coordinating and documenting with the Owner Representative or his/her designate the change order process and fully comply with requirements of Division 1.

3.10 ACCEPTANCE

A. The project specified by this specification shall be considered completed and signed off as completed by the Owner Representative or his/her designate contingent upon the following:

1. All punch lists have been completed and signed as complete by the Owner's Representative.
2. Abandoned cabling has been removed.
3. Cleaning is complete.
4. Required cable plant testing has been executed and required test result documentation has been submitted and approved by the Owner Representative or his/her designate - refer to Section 27 10 00 - Structured Cabling, Basic Materials & Methods
5. Any required adjustments to as-built drawings have been completed, submitted, and approved as complete by the Owner Representative or his/her designate.
6. Required warranty documentation has been submitted and approved as complete by the Owner Representative or his/her designate.

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SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section includes grounding and bonding of Communications Work, including but not limited to:

1. Communications Raceways
2. Cable Runway
3. Cable Shields
4. Protector Fields
5. Communications cabinets and enclosures.
6. Outside Plant Grounding and Bonding

B. Related Work Under Other Sections

1. Related Sections:

a. Section 27 0500 - Common Work Results for Communications
b. Section 27 0529 - Hangers and Supports for Communications Systems
c. Section 27 0533 - Conduits and Backboxes for Communications Systems
d. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures

1.2 SYSTEM DESCRIPTION

A. Provide telecommunications system grounding conductor as described herein and indicate on drawings.

B. Except as otherwise indicated, the complete communications installation including the metallic conduits and raceways, cable trays, boxes, cabinets, racks, panels, cable shields and lightning protectors shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically shown or specified.

C. Resistance:

1. Resistance from the farthest ground bus through the ground electrode to earth shall not exceed 5 Ohms or the requirements of ANSI-J-STD-607-

B-2011, whichever is more restrictive.

2. Resistance from Communications racks buss ground to Ufer ground must remain less than or equal to the electrical ground presented at A/C outlet for electronic equipment in the communications rack

1.3 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI-J-STD-607-B-2011 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
2. ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure

B. IEEE

1. IEEE C135.30 (1988) Standard for Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

C. Underwriters Laboratories (UL)

1. UL 467 (1993); R 2004 Grounding and Bonding Equipment

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 Common Work Results for Communications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

1. Ground Rod:

a. High strength high carbon steel, with electrolytically bonded jacket of copper on surface
b. 5/8" diameter minimum.
c. 5' long minimum.
d. UL spec. 467
e. ANSI C-33.8-1072.
f. Manufacturer:

1) Allied Bolt
2) Inwesco 12A60
3) Blackburn
4) Cooper Power Systems
5) Weaver.
6) Erico "Cadweld" Products, Inc.
7) ITT Blackburn.
8) Or equal.

2. Ground Wells:

   a. Christy Concrete Products, Inc.
   b. Forni Corp.
   c. Or equal.

3. Ground Bushings, Connectors, Jumpers and Bus:

   a. O-Z/Gedney.
   b. Thomas & Betts Corp.
   c. Or equal.

4. Compression Connector Lug

   a. Panduit
   b. B-Line SB-479 Series
   c. Thomas & Betts
   d. Or equal.

5. Telecommunications Ground Bus Bar

   a. CPI Telecommunications Grounding Bus Bar
   b. B-Line
   c. Panduit
   d. or equal.

6. Rack and Cabinet Grounding

   a. Middle Atlantic
   b. Panduit Structured Ground Kit
   c. Chatsworth Products Inc.
   d. or equal.

7. Bonding Ribbon:

   a. Annealed solid copper 3/8 inch wide x 1/16 inch thick, tin plated.
   b. Manufacturer:
      1) Inwesco 12A55

2) Corning Cable Systems
3) Preformed Line Products.
4) or equal.

8. Bonding Ribbon Clamp:

a. Soft lead
b. 1/16 inch thick
c. Bolt hole for attachment
d. Manufacturer:

1) Inwesco 12A56
2) Corning Cable Systems
3) Preformed Line Products.
4) Or equal.

9. Fargo Clamp:

a. Cast copper, silver plated, furnished with copper bolt.
b. RUS Listed
c. Manufacturer:

1) Allied Bolt
2) Inwesco 12A57
3) Corning Cable Systems
4) or equal.

10. Ground Inserts:

a. Cast Bronze with 1/4 copper Rod.
b. Provide minimum one each vault.
c. Provide minimum two each maintenance hole.
d. Manufacturer:

1) Inwesco 12H69
2) or equal by vault or manhole manufacturer.
3) or equal.

2.2 GROUND CONDUCTORS

A. General purpose insulated:

1. NRTL listed and code sized copper conductor, with dual rated THHN/THWN insulation, color solid green. The jacket may have a yellow stripe.

2. The jacket shall include markings that indicate conductor, manufacturer, and NRTL listing.
3. Minimum wire size is #6 AWG UON. Grounding conductors larger than 4 AWG (5 mm) shall be stranded. Use solid conductors for 4 AWG (5 mm) and smaller.
4. Use stranded grounding conductors at locations subject to vibration or repeated flexing, regardless of size.
5. Where continuous color-coded conductors are not commercially available, provide a minimum 4 in. long color band with green, non-aging, plastic tape in accordance with NEC. The band shall be located within 152 mm (6 in.) of each termination and splice and at 1.2 m (4 ft.) intervals along its run.
6. Plenum rated, if run in plenum spaces.

B. Telecommunications Bonding Backbone (TBB)

1. A TBB shall be provided between the TMGB and each TGB.
2. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 168 kcmil (No. 3/0 AWG; 12 mm).

C. Bonding Conductor for Telecommunications (BCT)

1. A BCT shall be provided between each TMGB and the building's service equipment (power) ground.
2. The BCT shall be the same size as, or larger than, the largest TBB.

D. Rack Bonding Conductor (RBC)

1. A separate RBC shall be provided between each cabinet or rack and the TGB or TMGB in the room.
2. Each RBC shall be sized as a 6 AWG (4 mm).

E. Bonding Jumpers

1. Bonding jumpers shall be used wherever two metallic parts meet in an electrically insecure connection. Examples include, without limitation, cable tray sections and cabinet or rack components and doors.
2. Bonding jumpers shall be factory pre-terminated.
3. Outside Plant Applications Grounding conductors shall be bare copper, meeting ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

F. Bonding pigtails: Insulated copper conductor, identified green, sized per code, and provided with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.3 COMPRESSION CONNECTOR LUG

A. Description

1. Connector lug with compression connection to conductor.
2. Copper alloy body.
3. Provide lug size to match conductor being terminated.
4. Provide 2 hole pattern lugs.
5. Provide each lug with silicon bronze hardware, including 2 bolts, 2 split lock washers and 2 nuts.

2.4 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron or steel body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.5 CONNECTIONS TO PIPE

A. For cable to pipe: UL listed bolted connection complying with CEC requirements.

2.6 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES

A. Where required by the Drawings or Specifications, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high pressure compression type connectors.

1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld, Thermoweld or equal. Each particular type of weld shall use a kit unique to that type of weld.
2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections. Connections shall be as manufactured by Thomas & Betts #53000 series, Burndy “Hy-Ground” or equal.

2.7 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

A. Where required by the drawing or specified herein.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide Grounding and Bonding according to the most restrictive

requirements of:

1. ANSI-J-STD-607-B-2011.
2. California Electrical Code Article 250 and references therein.
3. California Electrical Code Article 800.

B. In the event of conflicting requirements, California Electrical Code requirements shall prevail.

3.2 GENERAL

A. Provide Grounding and Bonding according to the most restrictive requirements of:

1. ANSI-J-STD-607-B.
2. California Electrical Code Article 250 and references therein.
3. California Electrical Code Article 800.

B. In the event of conflicting requirements, California Electrical Code requirements shall prevail.

C. Point of Connection

1. Under Work of this Section, make connections to Communications Ground Busbars provided under Work of Division 26, , as applies.
2. Install busbars per manufacturer's instructions and at locations shown on the plans. If locations are unclear, apply for and conform to direction from the University's Representative.

D. Routing

1. Bonding conductors shall be continuous and routed in as direct a route as possible to the point of termination while adhering to the following: No bonding conductor shall vertically traverse a wall except at wall corners.

E. Mechanical Connections

1. Make connections bare metal to bare metal.
2. At point of connection if device to be connected to does not provide dedicated unpainted grounding lug, remove paint to bare metal, make grounding or bonding connection, and apply touch up paint.
3. Clean ground bars prior to terminating bonding conductors
4. Torque threaded fasteners to manufacturer's recommended values.

F. Compression Connections

1. Make compression connections with the lug or fitting manufacturer's

recommended tooling, with the tooling set to the recommended force and stroke.

G. Communications Raceways and Sleeves

1. Bond metallic raceway and sleeves to the Communications Ground Busbar at the Communications Room that serves the related Communications Receptacle.
2. Where a metallic raceway connects 2 or more Communications Rooms, bond to the Communications Ground Busbar at each.

H. Cable Tray and Cable Runway

1. Coordinate with the Work of Section 27 05 36 - Cable Trays for Communications Systems
2. Provide manufacturer's bonding clips, plates or jumpers as required to comply with the UL Classified conditions for use as an equipment grounding conductor.
3. Bond the Cable Runway to the Communications Ground Busbar at the Communications Room served.

I. Cable Shields

1. Comply with National Electrical Code Article 800.

J. Protector Fields

1. Comply with National Electrical Code Article 800.

K. Communications cabinets and enclosures

1. Bond each cabinet to the Communications Ground Busbar at the Telecommunications Room.

L. Emergency/Information Telephone enclosures

1. Bond as detailed on Communications Drawings.

M. Communications Broadband Systems

1. Comply with National Electrical Code Article 820.
2. Ground Broadband passives as shown on Communications Drawings.

3.3 LABELING

A. All labels shall be permanent, computer-generated and nonmetallic, printed with wording in high contrast to the background. Comply with Section 27 05 53 -

Identification for Communications Systems.

B. Each telecommunications bonding conductor shall be labeled as close as practicable to its point of termination in a readable position. Labels shall have:

1. The statement, “If this connector or cable is loose or must be removed, please call the building telecommunications manager”.
2. An identification label providing the source and destination of the grounding conductor.
3. Conductors contained completely within one room need not have the source and destination label.
4. Instead, label the busbar at each connection with the name of bonded equipment (rack, tray, etc.) connected at that point.

C. The BCT, or the conduit containing it, shall be labeled:

1. At the TMGB with tag or adhesive label that states “Building Conductor for Telecommunications (BCT) to Main Electrical Service Ground Connection”.
2. At the main electrical service ground connection with tag or adhesive label that states “Building Conductor for Telecommunications (BCT) to Telecommunications Main Grounding Busbar (TMGB)”.

3.4 TESTING

A. All grounding connections shall be tested for continuity and resistance after installation but prior to substantial completion. The telecommunications contractor is to invite the Owner’s Representative to witness a portion of this testing while it is being performed.

B. The test performed shall use an earth ground resistance tester that is configured for a continuity test, otherwise known as a two-point test or a “dead earth” test. Tests shall be conducted between the electrical entrance ground and the TMGB as well as at each TGB. This resistance shall be less than 0.05 Ohms.

3.5 GROUNDING AND BONDING OUTSIDE CABLE PLANT (OSP)

A. Underground Communications Structure Ground Rods

1. Ground rods shall be installed at new communications handholes, vaults and pull boxes installed by the work of this Project. A ground rod shall be installed at new communications handholes, vaults, manholes and pillboxes installed by the work of this Project, or at existing underground structures used by the work of this Project lacking a ground rod.

   a. Provide two ground rods at maintenance holes.

b. Elsewhere provide one ground rod.

2. Ground rods shall be driven into the earth before the manhole floor is poured so that approximately 4 inches of the ground rod will extend above the manhole floor. When precast concrete manholes are used, the top of the ground rod may be below the manhole floor and a No. 1/0 AWG ground conductor brought into the manhole through a watertight sleeve in the manhole wall.
3. Ground rods installed in manholes, handholes, or concrete pull boxes shall be connected to cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths.

   a. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations.
   b. Grounding electrode conductors shall be neatly and firmly attached to manhole or handhole walls and the amount of exposed bare wire shall be held to a minimum.

B. Underground Cable Bonding

1. Cables used in underground conduit systems have either an outer metallic sheath or a plastic sheath. Cables with an outer metallic sheath shall be bonded at each Maintenance Hole (MH). Cables with an outer plastic sheath shall be bonded at MHs where a splice is made. When using OSP cable for a LAN drop, splices should not be made.

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SECTION 27 05 29

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of communications supports and cable hook system as described in this specification, including but not limited to:

1. Strut supports
2. Cable Hooks (J-hooks)
3. Beam clamps
4. Concrete Fasteners
5. Touch-Up Materials
6. Conduit supports.
7. Equipment supports.
8. Fastening hardware.

B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1. Section 27 0500 - Common Work Results for Communications
2. Section 27 0533 - Conduits and Backboxes for Communications Systems
3. Section 27 0536 - Cable Trays for Communications Systems
4. Section 27 0539 - Surface Raceways for Communications Systems
5. Section 27 0553 - Identification for Communications Systems
6. Section 27 1000 - Structured Cabling, Basic Materials and Methods
7. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures
8. Section 27 1123 - Communications Cable Management
9. Section 27 1300 - Communications Interior Backbone Cabling
10. Section 27 1500 - Communications Horizontal Cabling

1.2 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections for support of communications equipment specified for this Project.

B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.3 REFERENCES

A. American Society For Testing and Materials (ASTM)

1. ASTM A123/A123M-02 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A153/A153M-04 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. ASTM B633-98e1 Specification for Electro-deposited Coatings of Zinc on Iron and Steel.
4. ASTM A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. American National Standards Institute (ANSI)

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009
2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009
3. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, published 2009
4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, published 2008, plus errata issued in October 2008.
5. ANSI/ TIA 569-C (2012) Telecommunications Pathways and Spaces

C. National Fire Protection Association

1. NFPA 70, National Electrical Code

1.4 SUBMITTALS

A. Conform with the requirements of Section 01 3300 - Submittal Procedures and Section 27 05 00 - Common Work Results for Communications and the following:

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Cable hooks shall be listed and labeled by Underwriters Laboratories (UL) as required.

C. Cable hooks shall have the manufacturers name and part number stamped in the part itself for identification.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. General

1. Supports to be sized to suit load and selected to match mounting conditions

B. Manufacturers

1. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

a. Concrete fasteners:

1) Phillips "Red-Head".
2) Remington.
3) Ramset.
4) Hilti
5) Simpson Strong-Tie
6) or equal.

b. Concrete inserts and construction channel:

1) Unistrut Corp.
2) GS Metals "Globe Strut."
3) Thomas & Betts "Kindorf" Corp.
4) Or equal.

c. Conduit straps:

1) O-Z/Gedney.
2) Erico "Caddy" Fastening Products.
3) Thomas & Betts "Kindorf" Corp.
4) Or equal.

d. Beam Clamps

1) Cooper B-Line
2) SuperStrut
3) Unistrut
4) or equal

e. Aircraft Cable Sway Braces

1) Mason Industries
2) M.W. Sausse/Vibrex
3) Loos & Company, Inc.
4) or equal.

C. Concrete Fasteners

1. Furnish post-installed concrete anchors as required. Each post-installed anchor shall have an ICC-ES evaluation report stating that the product is compliant with the current edition of the CBC and the intended conditions of use.
2. Provide expansion-shield type concrete anchors.
3. Provide powder driven concrete fasteners with washers. Obtain approval from Owner's Representative prior to use.

D. Concrete Inserts

1. Provide pressed galvanized steel, concrete spot insert, with oval slot capable of accepting square or rectangular support nuts of ¼ inch to ½ inch diameter thread for rod support.

E. Aircraft cable sway braces

1. Steel rope sized to meet load.

F. Construction Channel:

1. Construction:

a. 1-5/8" square galvanized channel formed from U.S.S.G No. 12 or 0.109 inch cold formed steel with 17/32-inch diameter bolt holes, and 1-1/2 inch on center in the base of the channel.
b. 10 foot sections.

2. All supporting materials by same manufacturer.

G. Beam Clamps

1. Malleable iron electro-galvanized steel beam clamps selected to match building structural steel members.

H. Conduit Straps

1. One hole strap, steel or malleable iron, with malleable iron clamp-back spacer for surface mounted wall and ceiling applications.

    a. Use malleable strap with spacers for exterior and wet locations.
    b. Use steel strap without spacers for interior locations.
2. Steel channel conduit strap for support from construction channel.
3. Steel conduit hanger for pendant support with threaded rod
4. Steel wire conduit support strap for support from independent #12 gauge hanger wires.

I. Threaded rods, couplings, screws and nuts:

1. Electrolytically coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

J. Miscellaneous Parts

1. Hot dipped galvanized after fabrication; after cutting, de-burring and hole drilling. Coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

K. Paint/Tape for Touch-up:

1. Zinc: CRC "Zinc-It", Glyptal, Enterprise Galvanizing “Galambra”, or equal.

2.2 CABLE HANGERS

A. Ceiling Hung J-Hooks

1. Drawing Reference(s):

    a. WMJ
    b. ACJ

2. Features/Functions/Construction

    a. Specifically intended to carry the load of up to 50 communications cables without applying excess forces to cables at bottom of bundle.
    b. Integral broad bottom edge to spread cable load with flat bottom and provide a minimum of 1-5/8 inch cable bearing surface.
    c. Integral hanger rod attachment hardware at top.

d. Load rated for application.
e. Incorporates smooth 90-degree radiused edges to prevent snagging cable jackets on installation.
f. Designed so the mounting hardware is recessed to prevent cable damage.
g. Integral mechanical cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.
h. Suitable for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
i. Multi-tiered cable hooks to be used where required to provide separate cabling compartments, or where additional capacity is needed.
j. Finishes:

    1) Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
    2) Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

3. Manufacturer

    a. Cooper B-Line series BCH21, BCH32, BCH64
    b. Caddy/Erico CableCat
    c. or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The Owner's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the Owner.

3.2 EXAMINATION

A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.3 PREPARATION

A. Coordinate size, shape and location of concrete pads required for equipment installation with Division 3, Cast-in-place Concrete Specification.

B. Layout support devices to maintain headroom, neat mechanical appearance and to support the equipment loads.

C. Where shown on the Drawings or Specifications, install freestanding communications equipment on concrete pads.

3.4 INSTALLATION

A. Furnish and install supporting devices as noted throughout Division 27.

B. Communications device and conduit supports shall be independent of all other system supports that are not structural elements of the building, unless otherwise noted.

C. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps.

D. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls.

E. Use expansion anchors or preset inserts in solid masonry walls.

F. Use self-drilling anchors, expansion anchor, or preset inserts on concrete surfaces.

G. Use sheet metal screws in sheet metal studs and wood screws in wood construction.

H. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or acoustical ceiling suspension wires.

I. Do not drill structural steel members unless first approved in writing by the Owner's Representative.

J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

K. Install surface-mounted cabinets with minimum of four anchors. Provide

additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.

L. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.5 ERECTION OF METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.6 WOOD SUPPORTS

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.7 ANCHORAGE

A. Conform with the means of anchorage described in the Walnut Valley Water District approved Contract Documents

3.8 DISTRIBUTION PATHWAY VIA CEILING HUNG CABLE HOOKS (J-HOOKS):

A. Void, Plenum or Suspended Ceiling Exposed Cable Installation. Where drawings specifically show or permit use of exposed cable installation in voids, conform to the most restrictive requirements of Code, TIA-569-C and this Section.

B. Provide support for all cabling. Do not place or attach directly to T-bar grid, concealed spline grid, flexible or rigid ductwork, HVAC registers, sprinkler piping or fixtures, light fixtures or building structure. Conform to the National Electric Code.

C. Placement:

1. All pathways created by ceiling hung cable hooks shall be reviewed by the Owner’s Representative prior to installation.
2. Ceiling hung cable hooks and cabling supported by same shall not obscure access to access doors, hatches, air dampers, valves, filter

sections, VAV boxes, cable trays, junction boxes, pull boxes or similar areas of access required by other trades.

3. All ceiling hung cable hooks shall be mounted close enough together such that upon completion of the station cable installation a minimum amount of cable droop occurs between adjacent rings. The distance between supporting rings shall not exceed 48 inches or as required by the current edition of TIA-569-C.

D. Refer to the separation requirements listed in Section 27 15 00 - Communications Horizontal Cabling for minimum distances from electrical power and other electro-magnetic sources.

E. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.

1. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.
2. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.
3. Where aggregate cable bundle supported by ceiling hung cable hooks exceeds either the rated cable or weight load limit of the ceiling hung cable hook system, provide ceiling basket tray - Type CTW - as specified in Section 27 05 36.

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SECTION 27 05 33

CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Provide telecommunications pathways in accordance with ANSI/TIA-569-C, as specified in this Section and as shown on the plans. Provide system furniture pathways in accordance with UL 1286.

1. Provision of all low voltage Communications Systems Pathway, including:

   a. Rigid steel conduit and fittings.
   b. PVC insulated rigid steel conduit and fittings.
   c. Intermediate metal conduit and fittings.
   d. Electrical metallic tubing and fittings.
   e. Flexible metallic conduit and fittings.
   f. Liquidtight flexible metallic conduit and fittings.
   g. Miscellaneous conduit fittings and products.

2. Terminal cabinets and pull boxes
3. Device Boxes
4. TelePower Poles
5. Wireless Access Point Enclosures

B. Provide fire penetration sealant systems at rated wall and floor/ceiling penetrations and where indicated.

C. At Hazardous Occupancies, installation conforms to the requirements of National Electric Code for Class and Division rating of spaces.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1. Division 1: Cutting and patching.
2. Section 27 0500 - Common Work Results for Communications.
3. Section 27 0526 - Grounding and Bonding for Communications Systems
4. Section 27 0529 - Hangers and Supports for Communications Systems
5. Section 27 0533 - Conduits and Backboxes for Communications Systems

6. Section 27 0536 - Cable Trays for Communications Systems
7. Section 27 0539 - Surface Raceways for Communications Systems
8. Section 27 1000 - Structured Cabling, Basic Materials and Methods
9. Section 27 1300 - Communications Interior Backbone Cabling
10. Section 27 1500 - Communications Horizontal Cabling

1.3 REFERENCES

A. Usage: In accordance with Division 1.

1. American National Standards Institute (ANSI)
   a. ANSI C80.1 1994 Rigid Steel Conduit - Zinc Coated
   b. ANSI C80.3 1991 Electrical Metallic Tubing - Zinc Coated
2. American Society For Testing and Materials (ASTM)
   a. ASTM E 84 Surface Burning Characteristics of Building Materials
   b. ASTM E 119 Fire Tests of Building Construction and Materials
   c. ASTM E 814 Fire Tests of Penetration Firestop Systems
3. BICSI
   a. Telecommunications Distribution Methods Manual (TDMM)
   b. Information Transport Systems Installation Methods Manual (ITSIMM)
4. National Electrical Manufacturers Association (NEMA)
   a. NEMA 250-2003 Enclosures for Electrical Equipment (1000 Volts Maximum)
   b. NEMA FB 1 (ANSI/NEMA FB 1-2003) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
   c. FB 2.10 2000 Selection and Installation Guidelines For Fittings For Use With Non-Flexible Metallic Conduit Or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, And Electrical Metallic Tubing).
   d. FB 2.20 2000 Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable
   e. NEMA ICS 6 1988 (Rev. 1) Enclosures for Industrial Control and Systems
   f. NEMA OS 3-2002 Selection and Installation Guidelines for Electrical Outlet Boxes.
   g. NEMA RN 1-1998 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   h. NEMA TC 7 2000 Smooth Wall Coilable Polyethylene Electrical Plastic Duct
   i. NEMA TC 13 2000 Electrical Nonmetallic Tubing (ENT).
   j. NEMA TC 14 1984(R 1986) Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings

5. National Fire Protection Association
   a. NFPA 101 Life Safety Code
6. Underwriters Laboratories, Inc. (UL)
   a. UL 1 2000 Flexible Metal Conduit
   b. UL 6 2004 Electrical Rigid Metal Conduit - Steel
   c. UL 50 (1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
   d. UL 263 Fire Tests of Building Construction and Materials
   e. UL 360 1986 (Bul. 1991) (R 1993) Liquid-Tight Flexible Steel Conduit
   f. UL 514A 1991 (R 2004) Metallic Outlet Boxes
   g. UL 514B 1989 (R 2004) Conduit, Tubing and Cable Fittings
   h. UL 514C 1996 (R 2000) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
   i. UL 651 1989 (R 1989) (Bul. 1993) Schedule 40 and 80 Rigid PVC Conduit.
   j. UL 723 Surface Burning Characteristics of Building Materials
   k. UL 797 1993 (R 2004) Electrical Metallic Tubing - Steel
   l. UL 1242 1983 (R1993) (Bul. 1993) Intermediate Metal Conduit.
   m. UL 1286 (1999; R 2001, Bul. 2002) Office Furnishings
   n. UL 1479 Fire Tests of Through Penetration Firestops
   o. UL Fire Resistance Directories

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications and the following:

1. Contractor shall complete and submit for review to Owner's Representative, a Coring/Sawcutting Summary Description and obtain written authorization for Owner prior to the commencement of any cutting or coring activities. Contractor shall include all pertinent information with the Coring/Sawcutting Summary Description and submit with detailed work plan fourteen (14) days prior to desired coring/cutting activity.

   a. Coring/Saw-cutting Summary Description to identify means of protection of:

      1) Structural integrity of any element of Project.
      2) Integrity of weather-exposed or moisture-resistant element.
      3) Efficiency, maintenance, or safety of any operational element.
      4) Visual qualities of sight-exposed elements.
      5) Work of Owner.
      6) Utility supply, drains, fire alarm, communication.

b. Include in request:

1) Identification of Project, including Owner's Project Name and A/C number.Location and description of affected Work.
2) Necessity for cutting and patching.
3) Description of proposed work, and products to be used, methods to be employed to locate existing structural members.
4) Alternatives to cutting and patching.
5) Effect on work of Owner.
6) Date and time work will be executed.
7) Location on form for Owner’s Representative to provide direction.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Only products and applications listed in this Section may be used on the project unless otherwise submitted and approved by the Owner’s Representative.

C. Comply with Section 27 05 00 Common Work Results for Communications.

D. Firestopping installations shall use only complete systems purchased as a whole unit. Firestopping using individual material components or parts/materials collected from multiple kits is prohibited.

E. The firestopping systems used shall be tested and qualified for the purpose by an independent Nationally Recognized Testing Laboratory. Mortar, grout and similar substances shall not be used to seal telecommunications openings in a fire-rated wall, ceiling or floor.

F. Mortar may be used to fill the annular space around a sleeve only if such material and application meets the requirements of the California Building Code Section 713, paragraph 713.3.1.

G. Firestopping products shall bear the classification marking of the qualified testing and inspection agency.

H. Installation shall be by qualified and trained technicians. The Contractor shall, at their expense, replace entirely any firestop system installed by an uncertified installer. Minimum installer qualifications are as follows:

1. FM Research approved in accordance with FM AS 4991.
2. Certified, licensed, or otherwise qualified by the firestopping

manufacturer as having the necessary staff, training and a minimum of 1 year experience in the installation of the manufacturer's products per specified requirements.

I. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualification on the Installer. The Installer shall have been trained by a direct representative of the manufacturer (not a distributor or sales agent) in the proper selection and installation procedures.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide the following types of conduit systems listed by their commonly used generic name.

2.2 RACEWAY

A. Manufacturers:

1. Raceway:

   a. Allied Tube and Conduit Co.
   b. Triangle PWC, Inc.
   c. Western Tube and Conduit Corp.
   d. Spring City Electrical Manufacturing Co.
   e. Occidental Coating Co. (OCAL).
   f. Alflex Corp.
   g. American Flexible Metal Conduit Co.
   h. Anaconda.
   i. Or equal.

2. Fittings:

   a. Appleton Electric Co.
   b. OZ/Gedney.
   c. Thomas & Betts Corp.
   d. Spring City Electrical Manufacturing Co.
   e. Occidental Coating Co. (OCAL).
   f. Carlon.
   g. or equal.

B. Rigid Steel Conduit.

1. Drawing and Spec Reference: RSC.
2. Construction:

    a. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and UL 6.
    b. Standard threaded couplings, locknuts, bushings, and elbows: Only materials of steel or malleable iron are acceptable. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure.
    c. Three piece couplings: Electroplated, cast malleable iron.
    d. Insulating bushings: Threaded polypropylene or thermosetting phenolic rated 150 degree C minimum.
    e. Insulated grounding bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
    f. Insulated metallic bushings: Threaded cast malleable iron body with plastic insulated throat rated 150 degrees C.
    g. All fittings and connectors shall be threaded.

C. Coated Rigid Steel Conduit:

1. Drawing and Spec Reference: CRSC.
2. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.
3. Fittings:

    a. Conduit couplings and connectors shall be as specified for galvanized rigid steel conduit and shall be factory PVC coated with an insulating jacket equivalent to that of the coated material.
    b. Fittings over-sleeve to extend 1 conduit diameter or 1-1/2" beyond fitting, whichever is less.

4. Performance:

    a. Tensile Strength: 3500 psi.

5. Approvals:

    a. NEMA RN1 (Type 40 - 40 mils thick)
    b. CalTrans Type 2

6. Manufacturers:

    a. Plastibond by RobRoy Industries.
    b. Occal-40 by Occidental Coating Company.
    c. KorKap by Plastic Applicators.

d. Ocal-Blue
e. or equal.

D. Intermediate Metal Conduit

1. Drawing Reference: IMC
2. Conduit: Hot dip galvanized steel meeting the requirements of NEC Article 345 and conforming to ANSI C80.6 and UL 1242.
3. Fittings: Conduit couplings, connector and bushing shall be as specified for galvanized rigid steel conduit. Integral retractable type IMC couplings are also acceptable.

E. Electrical Metallic Tubing.

1. Drawing and Spec Reference: EMT.
2. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 specifications and shall meet UL classifications.
3. Set screw type couplings: Electroplated, steel or cast malleable iron, UL listed concrete tight. Use set screw type couplings with four setscrews each of conduit sizes over 2 inches. Setscrews shall be of case hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Set screw type connectors: Electroplated steel or cast malleable iron UL listed concrete tight with male hub and insulated plastic throat, 150 degree C temperature rated. Setscrew shall be same as for couplings.
5. Raintight couplings: Electroplate steel or cast malleable iron; UL listed raintight and concrete tight, using gland and ring compression type construction.
6. Raintight connectors: Electroplated steel or cast malleable iron, UL listed raintight and concrete tight, with insulated throat, using gland and ring compression type construction.

F. Flexible Conduit:

1. Drawing Reference: FLEX
2. Construction:

   a. Flexible steel, zinc coated on both inside and outside by hot-dipping process.
   b. Interlocking spirally wound continuous steel strip.
   c. 3/4" minimum size.

3. Fittings: Connectors shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Exception: Pressure cast screw-in connectors shall be

acceptable for fixture connection in suspended ceilings and cut-in outlet boxes within existing furred walls.

4. Approvals:

    a. UL 1

G. Liquidtight Flexible Metallic Conduit

1. Drawing Reference: Liquidtight
2. Conduit: Shall be fabricated in continuous lengths from galvanized steel strips, interlocking spirally wound, covered with extruded liquidtight jacket of polyvinyl chloride (PVC) and conforming to UL 360. Provide conduit with a continuous copper-bonding conductor wound spirally between the convolutions.
3. Fittings: Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

2.3 MISCELLANEOUS CONDUIT FITTINGS AND PRODUCTS

A. General

1. UL 514B.
2. Listed in UL Electrical Construction Materials List.

B. Conduit Fittings, Insulated Throat Grounding Bushings

1. Description
    a. Threaded for Rigid Steel Conduit and Intermediate Metal Conduit.
    b. UL Listed for use with copper conductors.
    c. Thermoplastic insulated liner for 105 degrees Celsius.
    d. Body of malleable iron, zinc plated; or die cast zinc.

2. Manufacturer

    a. Thomas & Betts (Steel City) BG-801 Series
    b. O-Z/Gedney
    c. or equal.

C. Watertight conduit entrance seals: Steel or cast malleable iron bodies and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Fittings shall be supplied with neoprene sealing rings between the body and PVC sleeve.

D. Watertight cable sealing bushings: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel sealing screws and zinc plated cast malleable iron locking collar.

E. Expansion fittings: Multi-piece unit comprised of a hot dip galvanized malleable iron or steel body and outside pressure bussing designed to allow a maximum of 4" conduit movement (2" in either direction). Furnish with external braid tinned copper bonding jumper. Unit shall be UL listed for wet or dry locations.

F. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve with internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling shall accommodate .75-inch deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections. Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber jacket and stainless steel jacket clamps. Unit shall comply with UL467 and UL514.

   1. Manufacturer:

      a. OZ/Gedney Type DX
      b. Steel City Type EDF
      c. or equal.

G. Standard products not herein specified:

   1. Submit for review a listing of standard electrical conduit hardware and fittings not herein specified prior to use or installation, i.e. locknuts, bushings, etc.
   2. Listing shall include manufacturers name, part numbers, and a written description of the item indicating type of material and construction.
   3. Miscellaneous components shall be equal in quality, material, and construction to similar items herein specified.

H. Hazardous area fittings: UL listed for the application.

2.4 BOXES AND ENCLOSURES

A. Junction and Device Boxes

   1. Drawing References: As shown on Symbol Schedule
   2. Construction:

      a. General
      b. One or two piece welded knockout boxes.

1) Interior

a) UL 514A, cadmium or zinc-coated 1.25 oz/sq. ft., if ferrous metal.
b) UL 514C approved if non-metallic.

2) Exterior - Conform to the Junction and/or PullBox construction scheduled on the Plans. Where construction not otherwise scheduled or noted on the plans, conform to the following

a) Cast iron or aluminum with threaded hubs and mounting lugs.
b) Gasketed cover with spring lid.

c. If size not otherwise noted, at least 4-11/16” Square by 2-1/8" deep, or Code minimum size, whichever is larger. Where Category 6A devices are terminated, minimum size to be 5” square (5S) by 3” deep.
d. Provide complete with approved type of connectors and required accessories, including attachment lugs or hangers. Provide raised device covers as required to accept scheduled device.
e. Concealed/Flush Mounted

1) Provide Flush Mount Device Boxes unless otherwise indicated.
2) At gypsum wall assemblies, hollow masonry, tile walls and plaster walls, provide with device rings as required.

f. Surface Mounted
1) Match Backbox to Device plate such that no sharp edges or voids remain exposed to the public.

g. Concrete floor embedded:

1) Cast iron concrete pour boxes with screwed brass cover, unless otherwise noted.
2) Cadmium plated screw cover attachment at least 6" on center.

3. Approvals.

a. UL 514A
b. UL 514C, if non-metallic

4. Manufacturers:

a. Interior:

1) Steel City.
2) Randl

3) Bowers
4) Thomas and Betts
5) or equal.

b. Exterior, exposed with cover of same construction.

1) Appleton
2) Pyle-National
3) or equal.

c. Other conditions:

1) Any meeting approvals and requirements.

2.5 TERMINAL BOXES, PULL CANS AND ENCLOSURES

A. Terminal Cabinets:

1. Drawing Reference: As Scheduled.
2. Construction:

a. General
1) Interior dimensions not less than those scheduled.
2) Door face to be not less than 95% of panel interior dimensions.
3) Provide with 3/4" fire retardant treated ply backboard where device termination scheduled/required within enclosure

b. Interior Application
c. Zinc Coated Sheet Steel, code gauge with standard concentric knockouts for conduit terminations.
d. Finish: Manufacturer's standard gray baked enamel finish.
e. Flush mounted enclosure Covers: Trim fitted, continuous hinged steel door, flush catch - lockable and keyed to match. Screw fastened doors not acceptable.
f. Surface mount cabinets shall be furnished with screw cover trim, flush hinged door and shall not be less than 6 inches deep.
g. Exterior Applications

1) Door and lock arrangement as required by manufacturer to maintain specified rating.

3. Mounting:

a. Flush mount cabinets shall be furnished with concealed trim clamps and shall be not less than 4 inches deep or as scheduled, whichever is greater

4. Approvals

    a. Interior Applications:

        1) NEMA 250 Type 1, unless otherwise noted. Refer to plans and schedules.

    b. Exterior Applications:

        1) NEMA 250 Type - As scheduled, not less than NEMA 3R. Provide NEMA 4 and 4X where scheduled or where required to match installation conditions.

5. Manufacturers, Metallic Enclosures:

    a. B-Line Electrical Enclosures
    b. Circle AW Products.
    c. Hammond
    d. Henessey.
    e. Hoffman.
    f. Myers Electric Products
    g. Rittal.
    h. or equal.

6. Manufacturers, Non-metallic Enclosures

    a. Stahlin Enclosures
    b. Cabletek
    c. RMS Electronics, Inc
    d. STI, Inc
    e. Vynckier Inc.
    f. Or equal.

2.6 TELEPOWER POLES

A. Telepower Poles, Multiservice

1. Drawing Reference(s):

    a. Power Pole
    b. Telepower Pole
    c. Communications Pole

2. Minimum Features, Functions, Construction:

    a. Frame

1) The frame shall be mill finished 6063-T6 aluminum with snap on steel and/or aluminum covers and satin anodized aluminum end caps. Covers and access panels may also be painted over and are suitable for field painting.
2) The frame shall be a four-piece design with two center supports and snap-on covers and end caps, yielding a total of three useable wire and cable channels. The product will be available in two sizes -- small and large. Total small width shall be 8.9" by 3.8" deep. The large size will be 13.4" wide by 3.8" deep. The aluminum extrusions will be a minimum thickness of 0.06", and steel covers
.040" . The system shall be available in 10' 6" height. The system shall be available with an extension kit that includes aluminum tubes to allow for varying ceiling heights up to 15'. Access panels and covers up to a height of 30" above finished floor will provide access to wiring and devices.
3) The frame supports shall be available with factory pre-punched holecuts for communication receptacles and trade knockouts for electrical terminations.

b. Center Panels

1) The center panel shall be constructed of painted steel, aluminum or stainless steel in 96", 30", 24", and 6" heights. A large assortment of center panel adornments shall be available. These finishes shall include wood laminate, metal laminate, nonmetallic laminate, fabric, and a painted surface. Perforated metal in painted steel and glass panels shall be available for the upper sections. An open center option is also offered. This option consists of a metallic panel from the floor to 30" high. The remainder of the center section is open to the ceiling.

c. Fittings

1) A full compliment of fittings must be available including, but not limited to, internal braces with knockouts, snap-in dividers and wire clips, ceiling and carpet trim pieces. The fittings shall be manufactured of extruded aluminum, galvanized steel, and/or plastic.
2) The assembly manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP, STP, Fiber Optic, Coaxial and other cabling types with faceplates and bezels to facilitate mounting.

3. Manufacturer:

a. Wiremold Vista, with Center Panel finishes as selected

by the Owner's Representative.
b. Hubbell
c. Or equal

2.7 WIRELESS ACCESS POINT ENCLOSURES

A. Wireless Access Point (WAP) Enclosure, Exterior Application

1. Drawing Reference: WAP - where shown at exterior of building and/or described as same in keynotes/schedules.
2. Features/Functions/Construction:

   a. Compact, low profile wireless access point enclosure suitable for use in continuous outdoor exposure under weather conditions typical of the project site.
   b. Designed to NEMA 1, 2, 4, 4X, 12, and 13, and IEC529-IP66 specifications for indoor/ outdoor wet, dirty, or corrosive environments.
   c. UV stabilized for exposure to direct sunlight
   d. Effectively transparent to wireless signals in the frequency bands used by IEEE 802.11a, b, g, n and ac signaling
   e. Included universal mounting plate allows easy installation of most manufacturers access points
   f. Solid opaque cover is hinged and can be latched and locked with Owner furnished padlock.
   g. UL508 listed. Back box and cover are light gray UL94-5VA Polycarbonate/PBT blend. Field paintable to match surrounding surfaces.
   h. Nominal dimensions: 15.7" x 11.7" x 4.8" deep.

3. Manufacturer:

   a. Oberon 1024-00 PBT/Polycarbonate NEMA 4 enclosure for WAP, with hinged, solid door.
   b. Or equal (no known equal).

2.8 THROUGH PENETRATION SEALING SYSTEMS

A. Through Penetration Sealant Assembly, Re-Enterable (Zero Maintenance)

1. Drawing Reference: TPSR and as required at all new through penetrations through rated partitions.
2. Application

   a. Provide at all locations where open wire communications cabling

penetrates fire-rated assemblies in basket tray, cable tray or supported by J-hooks. Zero-maintenance firestop assemblies shall be used when the pathway on one or both sides of the wall, ceiling or floor is open, such as J-hooks or cable tray.

b. Communications conduit sleeves through a single fire-rated wall shall not be used. For these applications, a zero-maintenance firestop assembly is required.

3. Functions

a. Cables passing through fire-rated floors or walls shall pass through fire-rated assemblies which can be used by the Owner's technical staff to add and remove cabling without having to apply or remove putty fill, backing or similar compounds to maintain the necessary fire rating.
b. Through penetration system to feature either automatic self adjustment mechanisms, or integral mechanical adjustment mechanisms to permit the Owner's staff to adapt the assembly to the fill condition without need for supplementary or disposable materials. The assembly shall contain a self-contained sealing system which shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to adjust, remove or reinstall firestop material.
c. Assemblies shall have an F Rating and T Rating equal to the rating of the barrier in which the device is installed, where such is performance is required by Code.
d. Assembly size and quantity shall be determined as follows:

1) For round openings, the fill ratio of cabling-to-opening-size shall not exceed 40%, or as dictated by the manufacturer, whichever is more stringent.
2) For rectangular openings, the fill ratio of cabling-to-opening size shall not exceed 50%, or as dictated by the manufacturer, whichever is more stringent.
3) Include in the cabling cross-sectional area enough spare capacity to accommodate 50% growth. Upon commissioning, if adequate spare capacity is not observed, the contractor shall install additional assemblies at their own cost to provide such spare capacity

4. Approvals:

a. California State Fire Marshal.
b. Tested to UL 1479
c. UL 2043

5. Manufacturers - Select for application:

    a. Specified Technologies Inc. EZ-Path Fire Rated Pathway
    b. Wiremold FlameStopper
    c. Hilti CP 653 Speedsleeve
    d. or equal.

B. Firestopping for Conduits and Other Closed Pathways

1. Approvals: California State Fire Marshal
2. Tested to UL 1479 or ASTM E814.
3. Manufacturers:

    a. Specified Technologies, Inc.
    b. 3M
    c. or equal.

2.9 SAW-CUTTING AND CORE-DRILLING EQUIPMENT AND MATERIALS

A. Cutting Equipment, Tools, and Materials

1. Contractor shall furnish appropriate and proper equipment, tools, and materials for the saw-cutting and core-drilling of concrete as required.
2. Lubricant material for the cutting of concrete shall be of type and manufacture for the purpose.

B. Concrete Bonding Agent: Adhesive for the bonding of new mortar and grout to existing concrete shall be “Concresive LPL” as manufactured by Master Builders, Burke’s “BurkEpoxy MV”, Sika’s “Sikadur 32, Hi-Mod”, or equal.

C. Patching Mortar

1. Mortar: Mortar shall be an epoxy mortar or similar high bonding mortar, such as “SikaTop 122” as manufactured by Sika Corporation, Burke, “Masterpatch 20” as manufactured by Master Builders, or equal.

D. Sand:

1. Sand shall be a washed, kiln-dried fine sand, all passing a U.S. Standard No. 16 sieve.

E. Curing Compound:

1. Water-based curing compound such as Master Builders “Masterkure”, Burke’s “Spartan-Cote”, or approved equal.

2.10 EXTERIOR JOINT SEALANTS

A. Exterior Polyurethane Weatherproofing and Control Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O; single component, chemical curing,

non-staining, non-bleeding, non-sagging type; color as selected; use in exterior vertical surfaces such as, but not limited to:

1. Sealing around exterior wall penetrations required for conduit pathways.
2. Manufacturers:

    a. Pecora Corporation; Dynatrol I.
    b. Sika Corporation, Inc.; Sikaflex 1a.
    c. BASF (Sonneborne); NP 1.
    d. Tremco; Dymonic FC.

B. Joint Sealant Backing

1. General: Provide sealant backings and accessory materials, including primers, of material and type that are non-staining; are compatible with joint substrates, sealants, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
2. Foam Joint Fillers: Non-gassing, preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of one of materials indicated below, as recommended by manufacturer for compatibility with their sealant; of size, shape, and density to control sealant depth, prevent three-sided adhesion, provide a surface against which to tool, and otherwise contribute to producing optimum sealant performance:

    a. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance and as recommended by sealant manufacturer.
    b. Elastomeric Tubing Sealant Backings: Flexible cellular rubber tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
    c. Filler Type at EIFS Conditions: Non-gassing, closed-cell polyethylene foam as recommended by EIFS manufacturer.

C. Miscellaneous Sealant Materials

1. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant-substrate tests and field tests. Certify that primer will not permanently stain adjacent joint surfaces.
2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
3. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints, to mask off adjacent joint surfaces where sealant is not permanently intended to be applied.
4. Bondbreaker Tape: Polyethylene pressure sensitive adhesive tape, to be used in areas where backer rod cannot fit and where three-sided adhesion is to be avoided.

PART 3 EXECUTION

3.1 CONDUIT APPLICATION

A. General: Install the following types of conduits and fittings in the locations listed, unless otherwise noted in the drawings:

1. Exterior, Exposed:

   a. Type RSC or IMC.

2. Interior, Exposed, Wet and Damp Locations:

   a. Type RSC.
   b. At interior locations over 8 feet above finished floor, EMT with compression fittings acceptable.

3. Interior, Hazardous Locations

   a. Type RSC
   b. Type IMC, where permitted by the CEC.

4. Interior, exposed or concealed, dry locations:

   a. RSC or IMC, if exposed or subject to physical abuse.
   b. EMT, if fully concealed.

5. Interior, concealed, damp locations, including in masonry walls.

    a. RSC or IMC

6. Embedded in Concrete

    a. RSC or rigid non-metallic conduit.
    b. PVC Schedule 40 or Type DB-120.

7. Transition from walls to open plan furniture systems:

    a. Liquidtight

3.2 GENERAL REQUIREMENTS

A. Refer to the manufacturer's instructions and conform thereto.

B. Distribution Pathway via EMT Raceway:

1. The EMT conduit is to be installed meeting the NEC handbook Article 348 Installation Specifications.
2. Provide escutcheon plates for all through wall conduit stubs.
3. All ends of conduits shall be cut square, reamed and fitted with insulated bushing.
4. All conduit which passes through fire walls shall be sealed with fire stop putty after all station wire has been installed.

3.3 MOUNTING AND INSTALLATION - BOXES AND ENCLOSURES

A. Conform to the more restrictive of NEMA OS 3-2002 and the following.

B. Provide backboxes at all communications systems devices. Installation of device plates directly to wall surface without use of a backbox, unless specifically directed on plans, is unacceptable.

C. The distance between pull boxes shall not exceed 150 feet or more than two 90 degree bends.

D. Align boxes plumb with floor and surrounding construction. At door frames, locate 4" from frame. Verify placement with Owner’s Representative details to ensure that box clears all trim, etc.

E. Support and fasten boxes securely. At stud walls use rigid bar hangers, attached to hanger with stud and nut.

F. At existing locations, provide cutting, patching and finishing as required to

maintain or restore finishes so that resulting installation is integrated into the Architectural decor of the particular location.

G. Mounting Height: the mounting height of a wall-mounted outlet box is defined as the height from the finished floor to the horizontal center line of the cover plate.

H. Mount outlet boxes with the long axis vertical. Three or more gang boxes shall be mounted with the long axis horizontal.

I. Install wiring jacks and outlet devices only in boxes which are clean; free from excess building materials, dirt, and debris.

J. Install wiring jacks and outlet devices after wiring work is complete.

3.4 SUPPORT

A. Provide supports for raceways as specified in Section 27 05 29 - Hangers and Supports for Communications Systems.

B. All raceways installed in exposed dry locations shall be grouped in a like arrangement and supported by means of conduit straps, wall brackets or trapeze hangers in accordance with Code and the requirements of the this Section. Fasten all hangers from the building structural system.

C. Provide supports and mounting attachments per the most restrictive of Code and the following.

RACEWAY SIZE (INCHES)	NO OF CABL ES IN RUN		LOCATION		SUPPO RT SPACIN G (FEET)	
					RSC	EMT
HORIZONTAL RUNS						
½, 3/4	1-2		FLAT CEILING WALL RUNS		5	5
½, 3/4	1-2		WHERE ACCESS LIMITED TO BUILDING STRUCTURE		7	7
½, 3/4	3≥		ANY LOCATION		7	7
1≥	1-2		FLAT CEILING OR WALL		6	6
1≥	1-2		WHERE ACCESS LIMITED TO		10	10

		BUILDING STRUCTURE		
1≥	**3≥**	**ANY LOCATIONS**	**10**	**10**
ANY	**ANY**	**CONCEALED**	**10**	**10**
VERTICAL RUNS				
½, 3/4	**ANY**	**EXPOSED**	**7**	**7**
1, 1-1/4	**ANY**	**EXPOSED**	**8**	**8**
1-1/2≥	**ANY**	**EXPOSED**	**10**	**10**

A. Install no more than one coupling or device between supports.

B. Conduit support

1. As specified in Section 27 05 29 - Hangers and Supports for Communications Systems

3.5 CUTTING AND PENETRATIONS

A. Execute all cutting, associated structural reinforcing, and patching/restoring work in a manner to prevent damage to other work and to provide proper surfaces for the installation of materials, equipment, and repairs.

B. Perform demolition in accordance with ANSI A10.6 “Safety Requirements for Demolition Operations” and NFPA 241 “Standard for Safeguarding Construction, Alteration, and Demolition Operations”, applicable regulatory requirements of public authorities having jurisdiction, the requirements of Division 1 and this specification section.

C. Do not cut or alter structural members when not indicated without prior approval of the Owner’s Representative.

D. Execute cutting and patching of weather-exposed, moisture-resistant and sight-exposed surfaces by methods to preserve weather, moisture and visual integrity. Employ skilled workers for cutting and patching. Wherever practicable, employ original installer or fabricator providing Work under this Contract to perform cutting and patching for new work.

E. Provide temporary support of construction to be cut to ensure structural integrity.

F. Perform cutting and patching using methods and materials so as not to void existing warranties.

G. Cutting:

1. Cut existing construction to provide for installation of Work. Make new openings neat, as close as possible to profiles indicated and only to extent necessary for new Work.
2. Do not cut or alter structural members without prior consultation with the Owner's Representative. Do not damage reinforcing or structural steel to remain. Do not damage electrical conduits, plumbing lines, and other utilities to remain. Restore any damaged work at Contractor's expense.
3. At concrete, masonry, paving, and other materials where edges of cuts and holes will remain exposed in the completed Work, make cuts using power-sawing and -coring equipment; do not overcut at corners of cut openings. Saw overruns shall not be permitted. Refer to additional concrete coring specific procedures below.

H. Adjust and fit products to provide a neat installation.

I. Concrete Coring:

1. Cutting work shall include saw-cutting of concrete and any other miscellaneous work, as required, core-drilling of concrete slabs and walls for structural work, or other items, and removal from the premises and site of all broken concrete and debris.
2. Contractor shall use extreme caution not to cut, nick, or break any rebar or post tension systems during execution of work.
3. Contractor shall select and employ a Testing Agency to furnish a pachometer, where required, and take readings for the location of reinforcing steel in existing concrete.

    a. The selected Testing Agency shall meet with the approval of the Owner's Representative.
    b. Pachometer readings shall be taken by the Contractor's employed Testing Agency to locate reinforcing steel, including but not limited to rebar and post-tension strand support members, in concrete to be cored and cut.
    c. The contractor or his testing agency shall mark the locations of the reinforcing steel with bright paint. Mark all reinforcing steel within 3 ft of all cuts and cores, except at slabs on grade and stem walls.
    d. Submit proposed methods for review by the Owner's Representative prior to proceeding as required elsewhere in this Section.
    e. Cutting work shall be accurately located and shall be closely coordinated with the individual trades requiring such cutting work.

f. Cutting work shall be neatly and accurately performed with proper tools and equipment. Cuts shall be of minimum size required for the work.
g. Work to remain shall be properly protected to prevent damage from core-drilling and saw-cutting operations. Lubricant to be used with the equipment shall be channeled to prevent damage to work to remain.
h. At the completion of work all visible marks shall be removed to the satisfaction of the Construction Manager.

J. Gypsum Wall Board Penetrations: Provide circular penetrations maximum 1/8" inch larger than outer diameter of conduit being used. On both sides of the wall fill space between conduit and wall with joint compound, depth to match gypsum board thickness.

K. All communications systems conduit openings in walls and floors are the responsibility of the Contractor. Install sleeves shown on the drawings when the concrete is poured. Any openings required after the concrete has set maybe core drilled per the procedures outlined above.

L. Patching and Restoring Work

1. General

a. Patching shall achieve security, strength, and weather protection, as applicable, and shall preserve continuity of existing fire ratings.
b. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.
c. Patch existing construction by filling repairing, refinishing, closing up and similar operations. Patching includes the insertion or projection of other products in or from a surface.
d. Patch weather-exposed components in a manner that restores them to a weathertight condition.
e. Finish or refinish, as required, cut and patched surfaces to provide an even surface of uniform finish, color, texture, and appearance, matching existing adjacent. Finish complete surface plane, unless otherwise indicated. Over patched wall or ceiling surfaces, finish to nearest cutoff line for entire surface, such as intersection with adjacent wall or ceiling, beam, pilasters or to nearest opening frame, unless otherwise indicated. Finished surfaces shall not present a spotty, touched-up appearance
f. Finish or refinish, as required; cut and patch surfaces to match adjacent finishes. Patching shall successfully duplicate undisturbed adjacent finishes, colors, textures, and profiles. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the Owner’s Representative’s judgment shall be final.

2. Concrete

   a. Preparation of Existing Surfaces: Use wire brush and air pressure to clean concrete of laitance, dirt, dust, and loose particles. Surface to received mortar shall be rough and reasonably even.

   b. Mixing of Materials: Concrete bonding adhesive and patching mortar shall be prepared and mixed in accordance with the manufacturer's specifications and recommendations. Two (2) to five (5) parts sand shall be added to mortar as required to achieve the desired consistency for the type of work involved.

   c. Patching of Concrete:

      1) Where removal of partitions, equipment, and other items has exposed holes in existing concrete floor slabs, fill in holes with new concrete and reinforce as necessary. Prepare slabs as required to provide clean, sound surfaces

      2) Patching of concrete work shall be expertly performed with adhesive and mortar materials specified. At completion, patched surfaces shall match adjacent surfaces as closely as possible.

      3) Concrete bonding agent and patching mortar shall be applied or installed where indicated on the drawings, or where otherwise required, in accordance with the manufacturer's specifications and recommendations.

      4) Where necessary to built-out cut, spalled, or chipped concrete surfaces, mix concrete bonding agent, mortar, and sand into a special mortar, and apply in layers as required to fill out or build up surfaces. Float, trowel, or texture new surfaces to match adjacent surfaces.

      5) Repair gravel pockets by cutting out (1 in. min.) to solid surface, form key and apply epoxy concrete adhesive before placing patching mortar; compact into place and neatly finish to exactly match surface texture. Honeycombed areas or gravel pockets which, in the Engineer's opinion, are too large and unsatisfactory for mortar patching as described above are to be cut to solid surfaces, keyed, and coated with epoxy concrete to produce firm bond and solid surface.

   d. Curing: Immediately after finishing patch approved curing compound according to manufacturer's instructions.

3.6 THROUGH PENETRATIONS SEALANT SYSTEMS

A. At a minimum, follow all manufacturer instructions. In case of

discrepancy between manufacturer and contractor requirements, the more stringent shall apply. In the case of conflicting instructions, report any discrepancy to the Owner's Representative in a timely fashion so as not to impact the construction timeline.

B. Application: Through Penetration Sealant Assemblies, Renenterable

1. Zero-maintenance firestop assemblies shall be used when the pathway on one or both sides of the wall, ceiling or floor is open, such as J-hooks or cable tray.
2. Communications cable tray or ladder rack shall not be continued through a fire-rated wall. Stop the tray or ladder rack, install multiple zero- maintenance firestop assemblies as needed, and continue the tray or ladder rack on the other side. Ensure grounding of the cable tray is continuous through the wall.
3. Communications conduit sleeves through a single fire-rated wall shall not be used. For these applications, a zero-maintenance firestop assembly is required.

C. Application: Firestopping for Conduits and Other Closed Pathways

1. Firestopping is required for all fire-rated penetrations where a communications conduit or other closed pathway penetrates one or more membranes of a fire-rated wall floor or ceiling
2. Required for all telecommunications outlets located on fire-rated walls. Systems shall be UL CLIV tested

D. For all penetrations for communications openings through fire-rated walls, floors and ceilings, install the same manufacturer's product for that type of penetration throughout the project.

E. Coordinate with all other trades prior to installation:

1. To ensure that through penetration firestop systems are installed according to specified requirements.
2. To ensure that sizing of openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems is appropriate.

F. All penetrations through fire-rated building structures (walls, ceilings and floors) shall be sealed with an appropriate firestop system that at least matches the fire rating of the structure. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire-rated structure).

1. Any penetrating item i.e., riser slots, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.
2. Through penetrations shall be sealed on both sides of the structure.

3. Telecommunications outlet back-boxes installed in fire-rated walls shall be completely enclosed in an appropriate firestopping assembly within the wall.
4. Conduit sleeves shall not be used for penetrating fire-rated floors, ceilings and walls. A zero-maintenance firestop assembly shall be used instead.

G. Verify the locations of all fire-rated walls prior to installation.

H. Firestopping assemblies must make a gas, smoke and water tight seal when activated in a fire.

I. Multiple cable bundles planned to penetrate a fire-rated wall and entering the same space within 10 feet of each other shall be consolidated in to a single penetration, unless one or both penetrations are membrane penetrations.

J. Ambient Conditions:

1. Do not install firestopping products when ambient or substrate temperatures are outside the limitations recommended by the manufacturer.
2. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.
3. Maintain the minimum temperature before, during, and for a minimum 3 days after installation of materials.

K. Schedule installation of firestopping after completion of the penetrating item (e.g., conduit) installation but prior to the covering or concealing of openings.

L. Before beginning installation:

1. Examine and clean the affected surfaces, as they shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.
2. Provide masking and temporary covering to protect adjacent surfaces.
3. Do not proceed until unsatisfactory conditions have been corrected.

M. After installation:

1. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
2. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.
3. Do not cover installed firestopping assemblies until inspected by the Owner’s Representative.

N. All firestop systems (including the cabling through them) and identification labels shall be installed prior to the Owner Representative's above-ceiling inspection.

O. Labeling

1. At all firestop locations, install a permanent label near the firestop on each side of the wall, ceiling or floor. Labels shall be pre-printed and include:

   a. Manufacturer of the firestop.
   b. Name of product and UL System Number.
   c. Name of installer and company name
   d. Date of installation.
   e. Rating of the wall/system (F and T ratings).

2. One location may have multiple labels (e.g. for a firestop in the annular space around a conduit penetration and a firestop within the conduit around the cables).
3. Labels shall not be painted over or otherwise obscured or defaced.

3.7 RACEWAY INSTALLATION, GENERAL

A. Conduit not otherwise sized shall be selected to provide not greater than 30% fill with the cabling indicated for installation under the work of the Project.

B. Raceway runs are shown schematically. Install concealed unless specifically shown otherwise. Supports, pull boxes, junction boxes and similar generally not indicated. Provide where designated.

1. Install exposed conduit and raceway parallel and perpendicular to nearby surfaces or exposed structural members, and follow the surface contours. Level and square conduit and raceway runs.
2. Raceway runs shall be mechanically and electrically continuous between all each equipment rack and utility demarcation point, receptacle and/or surface raceway strip, as applies.
3. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box, or outlet by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter.
4. Bends

   a. All bends or elbows shall have a minimum radius as follows:

CONDUIT SIZE	MIN. RADIUS (INCHES)
3/4"	8
1"	12
1-1/4"	18
2"	24
2-1/2"	24
3"	30
3-1/2"	30
4"	30
5"	36
6"	42

A. Use factory elbows or machine bends for conduit bends 1-1/4" and larger.

1. Make bends and offsets so the inside diameter is not effectively reduced. Make bends in parallel or banked runs from the same center line so that the bends are parallel.
2. Install at least one (1) 3/8", 200 pound strength nylon pull cord in all empty raceways.
3. Raceways crossing building expansion joints or in straight runs exceeding 100 feet shall be provided with UL listed expansion fittings.
4. Install conduit seals and drains to prevent accumulated moisture in conduits from entering Communications System enclosures.

B. Do not install conduit in concrete slabs unless specifically directed by Owner's Representative. Embedded conduits in concrete slab walls, and columns shall be installed in center third between upper and lower layers of reinforcing steel as directed by the Owner's Representative.

Space conduits 8" on center except at cabinet locations where slab thickness shall be increased as directed by the Owner's Representative.

C. All conduits to be kept 12" away from steam or hot water lines. Install horizontal conduit and raceway runs below water and steam piping.

D. Conduit dropping down to equipment shall be as straight as possible without any offsets, parallel or perpendicular to walls, ceilings and other building features.

E. Conduit installed on any equipment shall be run symmetrical with the

equipment and in such a manner as to:

1. not to be exposed to damage;
2. not interfere with access to components of the equipment that will interfere with maintenance operation or;
3. not to be in a manner that the Owner deems detrimental to its operation.

F. Whenever an installation such as that listed occurs, the Contractor shall make all necessary changes at no cost to the Owner.

G. All cut ends of conduit, scratches, tool marks, etc. on any metallic raceway installed in the ground or on the exterior of the building shall be treated with two coats of specified Touch Up Paint/Tape.

H. All raceways stubbing up into equipment or racks shall be sealed. Raceways with conductors shall be plugged with duct-seal. Spare raceways shall be capped. Prevent foreign matter from entering conduit and raceway; use temporary closure protection. Replace conduits containing concrete, varnish or other foreign material.

I. Complete installation of conduit and raceway runs before starting installation of cables/wires within conduit and raceway.

J. Use specified conduit and raceway fittings that are of types compatible with the associated conduit and raceway and suitable for the use and location. Join and terminate conduit and raceway with fittings designed and approved for the purpose of the conduit and raceway system and make up tight.

K. Where chase nipples are used, align the raceway and coupling square to the box and tighten the chase nipple so no threads are exposed.

L. Horizontal conduit or EMT runs, where required and permitted, shall be installed as close to ceiling or ceiling beams as practical.

M. Conduit and EMT connected to wall outlets shall be run in such a manner that they will not cross water, steam or waste pipes or radiator branches.

N. Conduit and EMT shall not be run through beams, purlins or columns except where permission is granted by Owner's Representative in writing.

O. Bond installed metallic raceway in accordance with the requirements of the NEC.

3.8 HAZARDOUS LOCATIONS

A. Use rigid steel conduit only.

B. Install UL listed sealing fittings that prevent passage of explosive vapors in accordance with the manufacturers written instructions. Locate fittings at suitable, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank coverplate having a finish similar to that of adjacent plates or surfaces.

C. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.

3.9 REUSE OF EXISTING CONDUIT

A. Existing conduit is to be used as a pathway only where so shown on the drawings.

B. Prior to beginning work involving the use of an existing conduit, the Contractor shall consult with the Owner's Representative in order to establish whether or not the conduit contains active service.

C. If no active service exists within the conduit, all cable is to be removed, and work is to proceed.

D. If active service does exist within the conduit and it has been determined that service needs to be disrupted, then work on that conduit shall not proceed until a schedule of service outage has been established by Owner's Representative. Once given permission to proceed, the Contractor shall within the time period of one (1) working day; remove the old cable, install, terminate and test the new cables, and notify the Owner's Representative the work using the specific conduit has been completed. The Owner's Representative shall be responsible for the disconnection and reconnecting of the active service cross-connects within the terminal closet(s).

E. Conduit preparation procedure:

1. Remove existing Wires and Cables (if any).
2. Run a mandrel ½" smaller than the inside diameter of the conduit through the conduit receiving new wires and cables.
3. If the specified size mandrel will not pass through the existing conduit, start with a smaller size mandrel and increase mandrel size until the specified sized mandrel will pass.
4. Run a wire brush and clean rag with an outside diameter 1/8" larger than the inside of the conduit through the conduit receiving new wires and cables.
5. Repeat above until conduit is clean and materials detrimental to the wire and cables to be installed no longer exit conduit with the clean rag.

3.10 TELEPOWER POLE

A. Prior to and during installation, refer to the system layout drawing containing all elements of the system. Installer shall comply with detailed manufacturer's instruction sheets, which accompany system components as well as complete system instruction sheets, using whichever is applicable.

B. Mechanical Security

1. All systems shall be mechanically continuous and connected to all electrical outlets, boxes, and cabinets, in accordance with manufacturer's installation sheets.

C. Electrical Security

1. The system shall be electrically continuous and bonded in accordance with the California Electric Code for proper grounding.

D. System Support

1. System shall be securely supported at the ceiling and the floor in accordance with manufacturer's installation sheets.

E. Completeness

1. All systems shall be installed complete, including insulating bushings and inserts where required by manufacturer's installation sheets. All unused openings where wire is exposed shall be closed.

3.11 STATION CABLE PATHWAY INSTALLATION

A. Cut In Boxes and Station Outlet Boxes:

1. Review the proposed installation height of the WAO's with the Owner Representative at each building, and within each building, at each major change in conditions prior to proceeding.
2. Standard Work Area Outlets (WAO)

   a. Unless otherwise noted on the plans, all cut in boxes and surface station outlet boxes installed for conventional application WAO's in walls with existing electrical receptacles that are installed within 18" of the floor are to be installed at +18" above finished floor) to center.
   b. Where standard WAO's are to be installed in walls without electrical receptacles, install new WAO's at a height of 38" A.F.F.(above finished floor) to center,

3. Wall Telephone WAO's

    a. For WAO's indicated for use for telephone wall jacks, cut-in boxes are to be installed at a height of 47" A.F.F to top of box.

4. All station outlets shall be installed so that their edges are parallel to the vertical and horizontal edges of the surface on which they are mounted.

3.12 WIRELESS ACCESS POINT ENCLOSURES

A. Mock Up

1. Prior to installation mockup each wireless access point enclosure for aesthetic review by the Owner's representative. Obtain the Owner Representative's review prior to proceeding.

B. Installation

1. Conform with the Manufacturers Installation instructions and the following, whichever is more restrictive.
2. Comply with the penetration details in the Drawings where penetrating existing exterior conditions.
3. Select fasteners appropriate to mounting conditions, weight and wind load of enclosure and existing surfaces in accordance with Section 27 05 29 - Hangers and Supports for Communications Systems. Make attachment to building structural elements, not surface finish materials.
4. Install enclosure plumb, parallel and aligned to surrounding surfaces. Center on surrounding architectural features were so directed by the Owner's Representative.
5. Seal holes at base of enclosure to provide NEMA 4 functionality as indicated in the manufacturer's instructions.
6. Paint enclosure and mounting hardware to exactly match surrounding surfaces. Protect the perimeter of the enclosure during the painting to ensure that operation of the door will not be impaired after painting.

C. Touch Up and Cleaning

1. Clean enclosures to like new condition. Provide Touch up painting and remove sealing debris as required following review by Owner's representative of installed condition.

3.13 EXTERIOR JOINT SEALANT APPLICATION

A. Examination

1. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.
2. Verify that joint sizes and surfaces are free of defects and acceptable for installation of joint sealants.
3. Verify joint dimensions and shapes to ensure they are within the sealant manufacturer's guidelines.

   Resolve any variances prior to installation. Do not proceed with sealant installation until the unsatisfactory conditions have been corrected.

B. Preparation

1. Thoroughly clean the areas that the new sealant will contact using a de-greasing solvent not harmful to the environment using the two-rag wipe technique. IPA (isopropyl alcohol) is not a degreasing solvent. The new sealant should have a minimum contact area of 1/4".
2. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

   a. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   b. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

      1) Concrete.
      2) Masonry.

   c. Remove laitance and form-release agents from concrete.
   d. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

      1) Metal.

2) Glass.
3) Porcelain enamel.
4) Glazed ceramic tile.

3. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

C. Joint Priming

1. Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on pre-construction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations.
2. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
3. Allow primer to dry. Do not prime areas that cannot be sealed the same day.

D. Installation of Sealant Backings

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

E. Installation Of Joint Sealants

1. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
2. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
3. Perform acoustical sealant application work in accordance with ASTM C919.
4. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint

widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

5. Install joint backing to maintain the following joint ratios, but in no case less than 1/4 inch (6 mm):

    a. Joints up to 1/2 inch wide: 1:1 width to depth ratio.
    b. Joints Greater than 1/2 inch wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.
    c. Sub-caulk joints that are deep, or joints without suitable backstop, to proper depth.
    d. Protect side walls of joint (to depth of caulking) with bond breaker tape.
    e. Install with adhesive on 2 faces in contact with sides of joints.

6. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint.

    a. Remove excess sealant from surfaces adjacent to joints.
    b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
    c. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.
    d. Provide flush joint configuration where indicated per Figure 5B in ASTM C1193.

F. Cleaning

1. Clean off excess sealants and sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
2. Leave finished work in a neat, clean condition with no evidence of spillovers onto adjacent surfaces.

G. Protection

1. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion.
2. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that

installations with repaired areas are indistinguishable from original work.

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SECTION 27 05 36

CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Cable Trays for Communications Cabling

1. Cable Trays
2. Cable Runways
3. Basket Tray

B. Cable Tray Support

1.2 RELATED WORK UNDER OTHER SECTIONS

A. Section 27 0500 - Common Work Results for Communications

B. Section 27 0526 - Grounding and Bonding for Communications Systems

C. Section 27 0529 - Hangers and Supports for Communications Systems

D. Section 27 0533 - Conduits and Backboxes for Communications Systems

E. Section 27 0539 - Surface Raceways for Communications Systems

F. Section 27 0553 - Identification for Communications Systems

G. Section 27 1000 - Structured Cabling, Basic Materials and Methods

H. Section 27 1300 - Communications Interior Backbone Cabling

I. Section 27 1500 - Communications Horizontal Cabling

1.3 REFERENCES

A. Usage: In accordance with Division 1.

B. Conform with the applicable portions of the following industry guidelines

1. ASTM International

a. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. National Electrical Manufacturers Association (NEMA)

a. NEMA FG 1 1-1998 Fiberglass Cable Tray Systems
b. NEMA VE 1 1-1998 Metal Cable Tray Systems.
c. NEMA VE 2 2001 Metal Cable Tray Installation Guidelines

3. National Fire Protection Association (NFPA)

a. NFPA 70B Recommended Practice for Electrical Equipment Maintenance

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications and the following:

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division1.

B. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.

C. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage. Replace any materials damaged by moisture exposure at no cost to the Owner.

1.6 SEQUENCING (Not Used)

PART 2 - PRODUCTS

2.1 CABLE TRAY, CABLE RUNWAY AND BASKET TRAY

A. Cable Tray

1. Drawing and spec reference: CTxx-yy, where "xx" denotes nominal width of cable runway in inches and “yy” denotes nominal depth.
2. Construction:

a. Two longitudinal Steel or aluminum members (side rails) with transverse members (rungs) mechanically fastened to the side rails.
b. Rungs 9" on center, unless otherwise noted and shall be capable of easy removal, reinstallation, or replacement if necessary.
c. Rung spacing in radiused fittings shall be 9” o.c. as measured at the center of the tray’s width.
d. UL Classified splice kits.
e. Accessories. Provide with a complete system of accessories, including radiused corners at vertical and horizontal bends, section splice plates, expansion plates, blind-end plates, etc. Provide waterfall drop-outs at each end of cabling racks and cabinets indicated on the plans scheduled or indicated to terminate open wiring systems.

3. Approvals:

a. ASTM A513
b. National Electrical Code, Article 318
c. NEMA VE1 Class 12C minimum, or to suit indicated cable and raceway loads, whichever is greater.

4. Manufacturers:

a. B-Line Redi-Rail Ladder Type Cable Tray with a complete system of accessories, including Ladder Drop-outs
b. Globe Tray
c. PW Industries
d. or equal.

B. Cable Runway

1. Drawing and spec reference: CR*, where "*" denotes nominal width of cable runway in inches.
2. Construction:

a. Solid Steel Side Bar per ASTM A-36 or Tubular Steel Side Bar per ASTM A-513.
b. 1.5" x 0.375 minimum tubular side stringers.
c. UL Classified splice kits.
d. Designed to support at least 100 pounds per foot load with a Safe Working Load deflection of ½” or less.

3. Finish: Telco gray powder coat or gold on zinc plating.

4. Approvals:

a. ASTM A513
b. UL Classified as an equipment grounding conductor.
c. National Electrical Code, Article 318

5. Manufacturers:

a. B-Line Telecom-Saunders SB-17.
b. Chatsworth Products Inc. 11275 series.
c. PW Industries
d. or equal.

C. Cable Tray, Open Wire Frame

1. Drawing and spec reference(s): CTWxx-y, where xx denotes the tray width and y the depth of the tray, in inches.

2. Construction

a. Welded wire mesh with continuous safety edge wire lip.
b. Mesh forms grid at nominally 2" by 4"
c. Carbon Steel
d. Electroplated zinc galvanized
e. All bends, seams and joints field fabricated from basic straight section pieces and splice components as supplied by the manufacturer.
f. Where supported from ceiling, supported at both sides in trapeze arrangement - centerline support not acceptable.
g. Provide a complete system of accessories, including bonding and grounding connections, conduit connectors, to terminate conduits extended to basket edge, radius shields to protect cabling at inside corners, and waterfall drop-outs at each end of cabling racks and cabinets indicated on the plans scheduled or indicated to terminate open wiring systems.
h. Provides pathway complying with ANSI/TIA-569C and NEMA Publications VE1 & VE2
i. Meets requirements of National Electrical Code, Article 318

3. Approvals:

a. NEMA Publications VE1 & VE2

4. Manufacturers:

a. B-Line Wire Basket Runway
b. Cablofil
c. G.S. Metals Corp

d. PW Industries
e. or equal.

D. Cable Tray, Fiberglass

1. Drawing and spec reference(s): CTFxx-y, where xx denotes the tray width and y the depth of the tray, in inches.

2. Construction

a. Non-metallic, Non-conductive, Fiberglass Construction, suitable for continuous exterior exposure in a marine environment.
b. Deep structural C-form side channels
c. Ladder rungs at 9" O.C., U.O.N
d. All bends, seams and joints field fabricated from basic straight section pieces and splice components as supplied by the manufacturer.

3. Approvals:

a. UL Listed as a system
b. ASTM A568
c. NEMA Publication FG1
d. NEMA 12C
e. National Electrical Code, Article 318.3
f. Meets ASTM E-84 smoke density rating; Polyester 680, Vinyl Ester 1025
g. Class 1 Flame Rating and self-extinguishing requirements of ASTM D-635.

4. Manufacturers:

a. Enduro Composite Systems.
b. Robroy
c. P-W Industries
d. or equal.

PART 3 - EXECUTION

3.1 CABLE TRAY APPLICATION

A. Unless otherwise noted, communications cable tray installations shall conform to the following:

1. Type CT - Within Communications Rooms (including ADF, BDF and IDF

spaces)

2. Type CTW - Horizontal station cabling outside of the communications rooms where shown on plans or where more than 100 cables are supported, whichever is greater.
3. Type CR - Wherever vertical transitions from ceiling or floor sleeves are required within the Communications Rooms.

3.2 INSTALLATION:

A. Provide all required supports, fittings and accessories for a complete system as described in NEMA VE-2, by Code, manufacturer recommendation or as shown on the plans, whichever is most restrictive.

1. Cable Tray. Provide with a complete system of accessories, including UL Classified splice kits, radiused corners at vertical and horizontal bends, section splice plates, expansion plates, blind-end plates, etc. Provide waterfall drop-outs at each end of cabling racks and cabinets indicated on the plans scheduled or indicated to terminate open wiring systems.

    a. Adjust rail position to align at dropout points and as directed by the Owner’s Representative to coordinate with the installation of the Owner’s materials and/or the work of other Projects.

2. Basket Tray
3. For wire basket tray, provide a complete system of accessories, including bonding and grounding connections, conduit connectors, to terminate conduits extended to basket edge, radius shields to protect cabling at inside corners, and waterfall drop-outs at each end of cabling racks and cabinets indicated on the plans scheduled or indicated to terminate open wiring systems.

B. Bond sections to one another and to building ground.

C. Access Clearance. Maintain access for use by Owner's personnel to tray as described below. Coordinate installation with work of structural, mechanical, plumbing/fire protection and electrical trades to maintain required access.

1. Unless shown otherwise on the plans, provide a clear access of at least 24" wide along one side of each tray for use by Owner's personnel.
2. Unless shown otherwise on the plans, installation to maintain at least 12" vertical clearance over the top of each tray for use by Owner's personnel.

3.3 SUPPORT

A. Support in accordance with the most restrictive of the following:

1. California Building Code.
2. Contractor's engineered means of engineered support submitted in accordance with the requirements of 27 05 00 - Common Work Results for Communications and Section 27 05 29 Hangers and Supports for Communications Systems.
3. Metallic Cable Tray: NEMA VE 2-2001, or latest edition
4. Fiberglass Cable Tray: NEMA FG-1-1998, or latest edition.

B. Provide lateral sway bracing as required by Code.

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SECTION 27 05 39

SURFACE RACEWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Metallic Surface Raceways

B. Non-Metallic Surface Raceways

C. Surface Raceway Fittings

D. Over floor Raceway

1.2 RELATED WORK UNDER OTHER SECTIONS

A. Section 27 0500 - Common Work Results for Communications

B. Section 27 0526 - Grounding and Bonding for Communications Systems

C. Section 27 0529 - Hangers and Supports for Communications Systems

D. Section 27 0533 - Conduits and Backboxes for Communications Systems

E. Section 27 0536 - Cable Trays for Communications Systems

F. Section 27 0553 - Identification for Communications Systems

G. Section 27 1000 - Structured Cabling, Basic Materials and Methods

H. Section 27 1300 - Communications Interior Backbone Cabling

I. Section 27 1500 - Communications Horizontal Cabling

1.3 REFERENCES

A. Usage: In accordance with Division 1.

1. American National Standards Institute (ANSI)

a. ANSI/TIA-569-C (2012) Telecommunications Pathways and Spaces

b. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009

2. Underwriters Laboratories, Inc. (UL)

a. UL 94 -1996 (R 2001), Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
b. UL 514C 1988 (R 1989) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications.

PART 2 PRODUCTS

2.1 GENERAL

A. Products provided under the work of this Section shall provide the following minimum characteristics:

1. Approvals
   a. U.L Listed
   b. Multi-chamber surface raceway shall conform to NEC 352B for simultaneous power and telecommunications use.

2. Meet or exceed the requirements of ANSI/TIA-569-C for a surface raceway system.
3. Fittings shall incorporate radiussed corners such that wiring cannot be placed therein with bend radius less than the minimum bend radius specified in ANSI/TIA-568C.1.
4. Raceway base shall be designed to be securely fastened to mounting surface per manufacturer's recommendations using mechanical fasteners. Systems requiring use of adhesive fasteners will not be accepted.
5. Raceway system shall include fittings for connection and change of raceway direction and/or plane of installation.
6. Available in-line raceway connector fittings shall include at least:

   a. External Elbow
   b. Flat Elbow
   c. Internal Elbow

d. End Cap
e. Splice Cover
f. Tee
g. Cable clips to retain contents in overhead installation. Alternatively, provide separate cable ties and independent restraint for same.

7. System shall accommodate connection to trade standard boxes and fittings through accessory boxes and transition pieces
8. Trade connections, device boxes and mounting systems shall not reduce fill capacity, except where specifically scheduled.
9. System shall include device plates of types to meet requirements shown on Communication Systems drawings.

10. Available device mounting boxes shall include at least:

    a. Raised Device Box
    b. 2-gang Raised Device Box
    c. In-Line Device Box

11. System shall include device plates of types to meet requirements shown on Communication Systems drawings.
12. Available device plates shall include at least:

    a. Single Receptacle Plate
    b. Duplex Receptacle Plate (NEMA 106)
    c. Duplex - Duplex (Quadplex) Plate
    d. Ring to secure 3rd party communications plates and jack subframes as specified in Section 27 15 00.

2.2 SURFACE RACEWAY

A. Metallic Surface Raceway

1. Drawing and Specification Reference: #MSR*, where "#" denotes number of chambers, "*" denotes cross sectional area of each chamber in square inches.
2. Construction

    a. Capacity:

        1) One chamber, 1.4 inches:

            a) Drawing and reference designation: 1MSR-1.4.
            b) Minimum cross-sectional area of 1.4 square inches.

2) One chamber, 6.75 inches:

a) Drawing and reference designation: 1MSR-6.75.
b) Minimum cross-sectional area of 6.75 square inches.

3) One chamber, 16.5 inches:

a) Drawing and reference designation: 1MSR-16.5
b) Minimum cross-sectional area of 16.5 square inches.

4) Two chamber, 3.3 inches:

a) Drawing and reference designation: 2MSR-3.3
b) Minimum cross-sectional area of each chamber equal to 3.3 square inches.

5) Two chamber, 8 inches:

a) Drawing and reference designation: 2MSR-8
b) Minimum cross-sectional area of each chamber equal to 8 square inches.

6) Three chamber, 5.5 inches:

a) Drawing and reference designation: 3MSR-5.5
b) Minimum cross-sectional area of each chamber equal to 5.5 square inches.

b. Material: Galvanized steel or anodized aluminum.
c. Provide Ivory color finish, unless otherwise noted.
d. Two chamber surface raceway shall have two adjacent chambers or equal area as specified separated by a removable horizontal dividers
e. Three chamber surface raceway shall have three adjacent chambers separated by removable horizontal dividers. Removal of one of the two dividers to result in a two chamber raceway systems with useable cross-sectional areas of 2/3'rds and 1/3 of the overall raceway capacity.
f. System and installation shall not compromise separation of Class 1 and low voltage services.
g. Keyed cover plate shall require tool for removal.

3. Manufacturers:

a. One chamber, 1.4 inches:

1) Wiremold 2400 System (Design Basis).

2) or equal (no known equal).

b. One chamber, 6.75 inches:

1) Wiremold V4000 System (Design Basis).
2) or equal (no known equal).

c. One chamber, 16.5 inches:

1) Wiremold V6000 System (Design Basis)
2) or equal (no known equal).

d. Two chamber, 3.3 inches:

1) Wiremold V4000 System with G4000D divider and G4001D divider clips as required (Design Basis).
2) or equal (no known equal).

e. Two chamber, 8 inches:

1) Wiremold V6000 System with G6000D divider and G6001D divider clips as required (Design Basis).
2) or equal (no known equal).

f. Three chamber, 5.5 inches:

1) Wiremold V6000 System with two G6000D dividers and G6001D divider clips as required (Design Basis).
2) or equal (no known equal).

B. SURFACE RACEWAY, NON-METALLIC:

1. Drawing & Spec Reference: #SR*, where "#" denotes number of chambers, "*" denotes cross sectional area of each chamber in square inches.
2. Construction

a. Single chamber, 1 square inch:

1) Drawing and reference designation: 1SR-1
2) Two piece construction or hinged single piece.
3) System components to provide at least a one (1) inch bend radius at corners.

b. Dual chamber, 2 square inches:

1) Drawing and reference designation: 2SR-2

2) Two piece construction.
3) At least 3.7 square inches of fill areas in each of two chambers.
4) System components to provide at least a one (1) inch bend radius at corners.

c. Three chamber, 3/4 inch:

1) Drawing and reference designation: 3SR-.75
2) Two piece construction.
3) Three chamber, 2.5 inch:
4) Drawing and reference designation: 3SR-2.5 System components to provide at least a one (1) inch bend radius at corners.

d. Color: White or Ivory, to best match surrounding surfaces. Submit color options to Owner's Representative for selection.
e. Three chamber surface raceway shall have three adjacent chambers separated by removable horizontal dividers. System and installation shall not compromise separation of services.
f. Keyed cover plate shall require tool for removal.

3. Approvals:

a. Plastic meeting UL 94 V-0 flammability rating.

4. Manufacturers, subject to the above:

a. One chamber, 1 inch (1SR-1)

1) Wiremold.PN10.
2) Panduit LDP-10.
3) Hubbell.
4) or equal.

b. Two chamber, 2 inch (2SR-2)

1) Wiremold 5400B Series (Design Basis).
2) Hubbell.
3) or equal.

c. Three chamber, 3/4 inch (3SR-.75)

1) Wiremold 5400 Series with 5400 BD Base (Design Basis).
2) Hubbell Mediatrak System.
3) or equal.

d. Three chamber, 2.5 inch (3SR2.5)

1) Wiremold 5500 Series with 5500BD Base (Design Basis).
2) Hubbell Mediatrak 10.
3) or equal.

2.3 OVERFLOOR RACEWAY

A. Over Floor Raceway System

1. Drawing References: Overfloor Raceway
2. Minimum Features, Functions, Construction:

   a. Intended by Manufacturer for use as a permanently installed overfloor raceway.
   b. Provides power, communication, and A/V wiring to areas where in-floor or ceiling distribution are not accessible options.
   c. Multiple channel base. Four-channel raceway provides space for multiple combinations of power, communication and A/V to be provided through a single raceway installation.
   d. Black powder coat finish. Durable textured finish resists scuffing and scratches.
   e. Multiple options for communication and A/V connectivity:

      1) System accepts manufacturers device plates that provide connectivity to a wide range of devices from leading communication and A/V providers.

   f. Attaches directly to floor covering. Works with carpet, tile, wood, etc. so there is no need to remove or alter existing floor coverings.
   g. Multiple transition options. Transition fittings are available to industry standard wall surface raceway systems and telepower poles.
   h. Tamper-resistant system. Raceway cover is difficult to remove without the proper tools, discouraging unwanted access to raceway-provided services.
   i. Meets ADA Accessibility Guidelines. Low profile, unobtrusive design meets the ADA Accessibility Guidelines that pertain to ADA Standard 4.5 which addresses changes in floor and ground surface levels.

3. Manufacturer

   a. Legrand Wiremold OFR. Provide complete system of fittings as required to meet field conditions
   b. Or equal (no known equal).

2.4 APPLICATION

A. Surface raceway installed in fire rated exitways shall be metal surface raceway.

2.5 GENERAL INSTALLATION:

A. Install complete raceway system as shown on drawings, including track, cover plate, device boxes, radiused inside and outside elbows and manufacturer's category and fiber cabling guideway fittings, splice plates, T's, transitions and extension rings and end caps as required.

B. Any existing surface raceway and/or exposed cabling along the indicated pathway of the raceway to be installed shall be removed prior to the installation of the new raceway. If the existing cabling contains active service, then Contractor shall consult with the Owner's Representative as to how best maintain the existing service before proceeding with the work.

C. Provide and install the proper factory fabricated corners, support clips, end connectors, etc. as required. Support and restrain cabling as required to suit installation conditions. Removal of the raceway cover shall not result in cabling dropping out of the raceway.

D. Corners and joints are to be cut neatly and finished using connector components of specified system. Where components are not available using specified system, to meet requirements of drawings, provide cleanly mitered joints, EMT and/or surface backboxes specified elsewhere herein.

E. All installed surface raceway shall be inspected for marks, scratches, gaps between sections or improper fitting of connector parts. All such damage shall be repaired to the Owner's Representatives satisfaction, or the raceway shall be removed and replaced.

F. Remove sharp corners and edges prior to installation of cable.

G. Attachment of raceway to walls, floors, and partitions:

1. Attach raceway to the supporting surface with mechanical fasteners applied to building structure per the most restrictive of manufacturer's directions, Code, or these provisions.
2. All surface raceway shall be installed so that its edges are parallel to the vertical or horizontal edge of the surface on which they are mounted. All surface raceway, found not to be installed in this manner, shall be removed and re-installed correctly.
3. Surface raceway shall be secured at 2'-0" intervals (2 spaced screws

for 2" and wider raceways) with wood screws into wooden framing or self drilling wall anchors (ITWBildex “Heavy Duty E-Z Toggle”, no known equal) into sheetrock or plastic inserts with
pre-assembled drive screw for concrete (ITT-HOLUB “HI-DRIVE” nail anchors, no known equal) Powder (explosive charge) driven anchors are not acceptable. The use of adhesives as the sole means for fastening to any surface is not allowed.

4. Screws used in fastening surface raceway shall be no less than 3/4" in length.
5. The proper support clips, as called for by the manufacturer, for securing surface raceway to walls or floors are to be used per the manufacturer's instructions.

H. Placement of surface raceway:

1. As indicated on the plans, all vertical runs from surface station outlets shall drop directly from a horizontal run to the station outlet unless noted otherwise.

    a. Raceway base and cover sections shall be minimum 24" long unless the run is shorter.
    b. Off-set cover joints from base joints by at least 12".
    c. Miter joints shall have gaps of less than 1/16". Caulk gaps after completion of wiring installation.

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SECTION 27 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, transportation and equipment to complete the furnishing, installation, assembly, and set up of the Communications System Raceway, Conduit and Backbone work indicated on the drawings and specified herein. Notwithstanding any detailed information in this Section, provide complete, contiguous working raceway systems.

B. Communications Outside Plant Ductwork - refer to the drawings for demarcation of the work of this Project.

1. Communications Outside Plant Ductwork.
2. Communications Manholes
3. Communications Pullboxes and Vaults
4. Connection of underground ductbanks to existing ductbank
5. Connection of underground ductbanks to buildings and new and existing manholes

1.2 RELATED WORK IN OTHER SECTIONS:

A. Section 31 23 33 - Trenching And Backfilling

1.3 REGULATORY REQUIREMENTS

A. California Electric Code

1.4 REFERENCES

A. Usage: In accordance with Division 1.

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M-306 Standard Specification For Drainage, Sewer, Utility, And Related Castings

C. American National Standards Institute (ANSI)

1. ANSI C80.1 1990 Rigid Steel Conduit - Zinc Coated
2. ANSI /SCTE 77 2007 Specification for Underground Enclosure Integrity

D. BICSI

1. 2004 Customer Owned Outside Plant Design Manual

E. National Electrical Manufacturers Association (NEMA)

1. NEMA 250-2003 Enclosures for Electrical Equipment (1000 Volts Maximum)
2. ANSI/NEMA FB 1-2003 Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
3. FB 2.10 2000 Selection and Installation Guidelines For Fittings For Use With Non-Flexible Metallic Conduit Or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, And Electrical Metallic Tubing).
4. FB 2.20 2000 Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable
5. NEMA FG 1 1-1998 Fiberglass Cable Tray Systems
6. NEMA ICS 6 2001 Industrial Controls and Systems Enclosures
7. NEMA RN 1 1998 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
8. NEMA TC 2 2003 Electrical Polyvinyl Chloride (PVC) Conduit
9. NEMA TC 3 1999 PVC Fittings for Use with Rigid PVC Conduit and Tubing
10. NEMA TC 6&8 2003 PVC Plastic Utilities Duct for Underground Installations
11. NEMA TC 7 2000 Smooth Wall Coilable Polyethylene Electrical Plastic Duct
12. NEMA TC 9 1999 Fittings for ABS and PVC Plastic Utilities Duct for Underground Application
13. NEMA TC 14 1984(R 1997) Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
14. NEMA TC 19 2001 Nonmetallic Riser U-Type Guards
15. NEMA VE 1 1-1998 Metallic Cable Tray Systems.
16. NEMA VE 2 2001 Cable Tray Installation Guidelines
17. Underwriters Laboratories, Inc. (UL)

    a. UL 6 2004 Electrical Rigid Metal Conduit - Steel
    b. UL 360 1986 (R 2003) Liquid-Tight Flexible Steel Conduit
    c. UL 514A 1991 (R 2004) Metallic Outlet Boxes
    d. UL 514B 1989 (R 2004) Conduit, Tubing, and Cable Fittings
    e. UL 514C 1988 (R 1996) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
    f. UL 651 1989 (R 1995) Schedule 40 and 80 Rigid PVC Conduit.

1.5 SUBMITALS AND SHOP DRAWINGS

A. Procedures: In accordance with Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1.

B. Duct

1. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances.
2. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

PART 2 - PRODUCTS

2.1 DUCTBANK CONSTRUCTION

A. PVC Conduit

1. Drawing and Spec Reference: PVC.
2. Construction:

a. 4" trade diameter, unless otherwise noted.
b. Poly-vinyl chloride.
c. Schedule by Application

1) Straight segments, Schedule 40.
2) Flat elbows, Schedule 40.
3) Vertical elbows sweep up to grade, Schedule 80.
4) Above grade, Schedule 80.

d. Elbows.

1) Where innerduct liner is scheduled - CRSC.
2) Elsewhere, Schedule 80.
3) 90° C rated.
4) Solvent welded joints, joints by pipe manufacturer.

e. Application.

1) Soil Backfill/Direct Burial

a) RUS Type II, Type C or Type DB

b) Schedule 40.

2) Concrete Encasement:

a) PVC Type DB-120,
b) RUS Type I, Type B or Type EB
c) Any meeting Soil Backfill/Direct Burial.

3) Boring

a) HDPE.
b) RUS Type Flexible Plastic.

f. Performance:

1) Tensile Strength: 7,000 psi at 73.4° F.
2) Flexural Strength: 11,000 psi.
3) Compressive Strength: 8,600 psi.

g. Approvals:

1) RUS Listed for Telephone Cable Installation 5-99 Edition, or latest release thereof.
2) NEMA TC-2, PVC Type EPC-40 and EPC-80.
3) NEMA TC-3.
4) NEMA TC14 Fiberglass Conduit.
5) UL 514 fittings.
6) UL 651.
7) ANSI C33.91.

h. Manufacturers:

1) RUS Listed:

MANUFACTURER	**RUS LISTED FOR**	**MANUFACTURER PART NUMBER**
ALLWIRE, INC.	**FLEXIBLE PLASTIC**	**ALLDUCT**
AMERICAN PIPE & PLASTICS	**PLASTIC**	**TYPE B, C, AND D**
	PLASTIC	**TYPE EB AND DB**
	PLASTIC	**PVC MULTI-DUCT (2,3,4 AND 6-WAY)**
AMERICON INTERNATIONAL	**FLEXIBLE PLASTIC**	**HDPE DUCT**
	PLASTIC	**PVC TYPE C**
APACHE PLASTICS, INC.	**PLASTIC**	**TYPE EB AND TYPE DB**
ARMCO	**PLASTIC**	**SMOOTH-COR TYPE B AND TYPE C**

ARNCO	FLEXIBLE PLASTIC	HDPE CONDUIT
BAY PLASTICS, INC.	PLASTIC	TYPE B AND TYPE C
BRISTOLPIPE	PLASTIC	TYPE B, C, AND D
	PLASTIC	TYPE EB AND TYPE DB
CAN-TEX	PLASTIC	TYPE EB AND TYPE DB
	PLASTIC	TYPE B, C, AND D
CARLON	PLASTIC	TYPE EB AND TYPE DB
	PLASTIC	TYPE B, C, AND D
	PLASTIC	MULTI-GARD
CERTAIN-TEED PRODUCTS CORP.	PLASTIC	TYPE EB AND TYPE DB
CIBA-GEIGY	FIBERGLASS	T & D CONDUIT
CONDUX INTERNATIONAL, INC.	CONCRETE	CONDUX
	PLASTIC	TYPE EB AND TYPE DB
CSR POLYPIPE	FLEXIBLE PLASTIC	HDPE DUCT
DURA-LINE	FLEXIBLE PLASTIC	HDPE DUCT
EAGLE PACIFIC INDUSTRIES, INC.	PLASTIC	TYPE EB AND TYPE DB
	FLEXIBLE PLASTIC	HDPE COILED DUCT
ENDOT INDUSTRIES	FLEXIBLE PLASTIC	HDPE DUCT
FREEDOM PLASTICS, INC.	PLASTIC	TYPE C
HERCULES, INC.	FLEXIBLE PLASTIC	CORFLO PLASTIC CONDUIT
HURLBUT PLASTIC PIPE	PLASTIC	TYPE C
INGOMAR PLASTIC PIPE	PLASTIC	TYPE B AND TYPE C
J-M MANUFACTURING COMPANY	PLASTIC	TYPES C, EB, AND DB
KYOVA	PLASTIC	TYPE EB AND TYPE DB
LCP NATIONAL PLASTICS, INC.	PLASTIC	TYPE EB AND TYPE DB
	PLASTIC	TYPE B AND TYPE C
NORTHERN PIPE PRODUCTS	PLASTIC	TYPE B, C, AND D
OMNI	FLEXIBLE PLASTIC	HDPE DUCT
PETROFLEX	FLEXIBLE PLASTIC	HDPE DUCT
	FLEXIBLE PLASTIC	CORRUGATED HDPE DUCT
PHILLIPS PRODUCTS CO., INC.	FLEXIBLE PLASTIC	DRISCON 3200
PHONE DUCS	PLASTIC	MULTIPLE PLASTIC CONDUIT (4, 6, & 9 WAY)
PLEXCO	FLEXIBLE PLASTIC	PLEXCO DUCT
PWPIPE	PLASTIC	TYPE EB AND TYPE DB

PYRAMID INDUSTRIES, INC.	**PLASTIC**	**TYPE EB AND TYPE DM**
	FLEXIBLE PLASTIC	**HDPE CONDUIT**
QUAIL PLASTICS	**PLASTIC**	**TYPE EB AND TYPE DB**
QUEEN CITY PLASTICS	**PLASTIC**	**TYPE EB AND TYPE DB**
RIVER CITY PLASTICS	**PLASTIC**	**TYPE EB AND TYPE DB**
SEDCO	**PLASTIC**	**TYPE EB AND TYPE DB**
SOUTHERN PIPE, INC.	**PLASTIC**	**PVC TYPES EB, DB, AND SCH. 40**
TAMAQUA CABLE PRODUCTS	**FLEXIBLE PLASTIC**	**HDPE DUCT**
TRIDYN INDUSTRIES	**PLASTIC**	**TYPE EB AND TYPE DB**
VASSALLO INDUSTRIES	**PLASTIC**	**TYPE B AND TYPE C**
WESFLEX	**FLEXIBLE PLASTIC**	**FLEX-CON**

A. or equal

B. Fiberglass Conduit
   1. Drawing Reference: Fiberglass
   2. Construction:
      a. Trade Standard Sizes
      b. Meets NEMA TC 14
      c. Complete system of joints and threaded steel conduit couplers
   3. Manufacturers:
      a. TVC Communication/Vikimatic Fiberglass Conduit
      b. Champion Fiberglass
      c. FRE Composite
      d. or equal.

2.2 FITTINGS

A. Couplings, adapters, transition fittings, etc., shall be molded PVC, slip on, solvent weld type conforming to NEMA TC3 for Schedule 40 or 80 and NEMA TC 9 for type EB or DB.

B. Fitting Types

   1. Expansion Fittings, 12”, Metallic:
   2. Function: At road or bridge expansion joints requiring up to 12” of expansion compensation.
   3. Construction

      a. Steel, hot dip galvanized.
      b. Nylon wear bushings
      c. O-ring seal

d. Bonding jumper

4. Manufacturers:

a. O-Z Gedney Type AX, Type AX-8, and Type EX fittings with Type BJ Bonding Jumper.
b. TVC/Vikimatic VB0285X series.
c. Or Equal.

C. Expansion Fittings, 6”, Non-metallic:

1. Function: At road or bridge expansion joints requiring up to 6” of expansion compensation.

2. Construction

a. Fiberglass
b. Provide bonding jumper.

3. Manufacturers:

a. TVC Communications HW or Extra Heavy Wall Expansion Joint.
b. Vikimatic
c. FRE Composites, Inc.
d. Or Equal.

D. Caps, Underground Conduit Stubs

1. Provide at each location indicated for future expansion.
2. Wateright.
3. Manufacturers:

a. Carlon E985N
b. Vikimatic
c. or equal by manufacturers listed in this Section for underground ductbank construction.

2.3 UNDERGROUND STRUCTURES

A. Vaults, PullBoxes and Manholes, Precast, General

1. Precast units shall be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes, boxes and handholes.
2. Construction

a. General

1) Castings shall be free from warp and blow holes that may impair strength or appearance.
2) Structures shall be precast to the design and details indicated, precast monolithically and placed as a unit, or structures may be assembled in sections, designed and produced by the manufacturer in accordance with the requirements specified.
3) Structures shall be identified with the manufacturer's name embedded in or otherwise permanently attached to an interior wall face.
4) Structure top and wall shall be of a uniform thickness of not less than 4 inches except at knockouts.
5) The minimum concrete cover for reinforcing steel shall be 2 inches.
6) All steel, except reinforcing steel, shall be hot dip galvanized after fabrication.
7) Knockouts & Windows

    a) Thin-walled knock-out panels designed for future duct bank entrances are permitted.
    b) Sides of precast windows shall be a minimum of 4 inches from the inside surface of adjacent walls, floors, or ceilings.
    c) Form of the perimeter of precast window openings to have a keyed or inward flared surface to provide a positive interlock with the mating duct bank envelope.
    d) Provide welded wire-fabric reinforcing through window openings for in-field cutting and flaring into duct bank envelopes.
    e) Provide additional reinforcing steel comprised of at least 2 No. 4 bars around window openings.

8) Extension Rings

    a) Provide extension rings as-required to extend from finished grade to communications utilities.

9) Bottom and Drain Sumps

    a) Provide solid concrete bottom surface.
    b) Provide drain sumps for precast structures a minimum of 12 inches in diameter and 4 inches deep.

3. Joints:

    a. Provide tongue-and-groove or shiplap joints on mating edges of precast components.
    b. Design joints to firmly interlock adjoining components and to provide waterproof junctions, and adequate shear transfer.

c. Seal joints watertight using preformed plastic strip conforming to AASHTO M198, Type B.

4. Frames and Covers

a. Covers to match across all utilities.
b. Provide fiber composite lids at pedestrian rated covers, H-20 steel slip resistant covers otherwise.
c. Labeling

1) Provide labeling as follows:

a) “Communications”
b) Owner's Manhole or Vault No, as shown on drawings or provided to Contractor prior to vault order placement.

2) Labeling shall be:

a) Cast in concrete lids
b) Written in weld on steel lids
c) Alternatively, for pedestrian grade vault lids and for the vault number only, provide ½” tall, 1/8” min. thickness lamacoid label, rivet attached to box top in recess area below surface of lid.

5. Pulling-In-Irons

a. Steel bars bent in the form indicated and cast in the walls and floors.
b. Install a pulling-in iron in the wall opposite each duct line entrance at walls, not less than 6 inches above or below, and opposite the ducts entering the manhole.
c. Pulling-in irons shall project into the manhole approximately 4 inches, or be cast in a pocket. Iron shall be hot-dipped galvanized after fabrication.

6. Cable Racks and Arms

a. Provide nonmetallic cable racks:

1) Vaults and pullboxes. Minimum two (2), at each vault face 24 inches or longer, at least one (1) each face otherwise.
2) Manholes. Provide AT&T standard arrangement of cable racks at each manhole.

a) Provide two cable racks arms - minimum 12” arms - for each cable rack provided at each manhole or vault as required above.

B. Underground Pull Boxes and Vaults, Concrete with Diamond Plate Steel or Concrete Lids

1. Drawing and Specification References:

   a. PB1P
   b. PB1T
   c. PB2P
   d. PB2T
   e. PB3T

2. Minimum Size
   a. PB1* - 14x20
   b. PB2* - 18x30
   c. PB3* - 36x60
   d. Provide scheduled or larger size.
   e. Provide extension rings as required to meet required depth.

3. Minimum Load Performance:

   a. PB*P - where * is the vault size: Manufacturer's Parkway/Pedestrian Box/Lid or using Polymer Concrete Box lid meeting ANSI/SCTE 77-2007 Tier 8.
   b. PB*T - where * is the vault size: Per AASHTO H-22.

4. Lid Construction:

   a. As scheduled on the plans and in the schedule of applications in Part 3.
   b. Labeling "Communications" in addition to the vault number identified by the Owner.

5. Solid Bottom, with sump as indicated on the plans.
6. Sidewall Duct Entries with bell end fittings.
7. Cover Components
   a. PB1 and PB2 Size: One piece construction
   b. PB3 Size: Two piece hinged lids with torsion spring lifters.
8. Manufacturers:
   a. Oldcastle Precast
   b. Brooks Products
      1) 1P & 1T: 5 Series and extension rings as required
      2) 2P & 2T: 67 Series and extension rings as required
      3) 3T: 400 Series with 11C Type Lid.
   c. Jensen PreCast
      1) PB1P: P9 with FL9D lid, P9BA base and extension rings as required.
      2) PB1T P9 with P9-61 lid, P9BA base and extension rings as required
      3) PB2P: P36 with FL36D cover, P36BA base and extension rings as

required
4) PB2T: P36 with P36-61D lid, P36BA base and extension rings as required
5) PB3T: 35TA

d. Utility Vault Company, Inc./Oldcastle Precast
1) PB3T: PTS-3660, with H-20-44 loading cover, with 3660-06 and 3660-12 extensions as required.

e. Oldcastle Precast - Christy
f. Associated Concrete Products
g. Forni Corporation.
h. Or equal.

C. Underground Pull Boxes and Vaults, Polymer Concrete
1. Drawing and Specification References - where the option to use of composite vault assemblies is indicated on the plans and per Part 3 of these specifications
a. PB1P
b. PB1T
c. PB2P
d. PB2T
e. PB3T
2. Minimum Size
(inches) a. PB1*
- 14x20
b. PB2* -
18x30 c.
PB3* -
36x60
d. Provide scheduled or larger size.
e. Provide extension rings as required to meet required depth.
3. Cover Components
a. PB1 and PB2 Size: One piece construction
b. PB3 Size: Two piece hinged lids with torsion spring lifters.
4. Construction:
a. Polymer concrete cover and body.
5. Labeling
a. Labeling "Communications" in addition to the vault number identified by the Owner.
6. Sidewall Duct Entries with bell end fittings.
7. Solid bottom with sump as indicated on the plans.
8. Minimum Load Performance:
a. PB*P - where * is the vault size: ANSI/SCTE 77-2007 Tier 8.
b. PB*T - where * is the vault size: At indicated dirt roads, per ANSI/SCTE 77-2007 Tier 22.
9. Manufacturers

a. Armorcast Polymer Concrete Vaults
b. Oldcastle Enclosure Solutions H-Series
c. New Basis
d. Quazite
e. Hubbell Power Systems
f. Or equal.

2.4 MISCELLANEOUS UNDERGROUND PRODUCTS

A. Cable Warning Tape
1. Provide
a. 6 inches wide minimum.
b. 5 mil plastic.
c. Metallic backing at least 10 feet o.c.
d. 1 mil metallic foil core.
e. Orange in color
f. Suitable for buried applications.
g. Continuously imprinted with the words "WARNING - COMMUNICATIONS CABLE BELOW" or similar at not more than 48 inch intervals.
2. Manufacturers:
a. Carlon Telecom Systems.
b. Monarch Duct &Conduit
c. Vikimatic
d. Or equal.

B. Pull Rope
1. At least 3/8 inch diameter polyethylene or 3/8” min width woven aramid fiber pulltape.
2. 200 pound minimum strength.
3. Manufacturers:
a. Arnco Dandy-Line
b. Carlon Telecom Systems.
c. Fibertek Pull-line
d. Monarch Duct & Conduit
e. Vikimatic
f. Any length marked tape listed elsewhere herein below constructed as a pulltape.
g. Or equal.

C. Length Marked Tape
1. Provide 1/2 inch flat tape with sequential markings in whole feet.
2. Manufacturers:
a. Carlon Telecom Systems.
b. Greenlee
c. Fibertek Pulltape or Tracertape
d. Vikimatic

e. Or equal.

D. Conduit Plugs
1. Provide universal blank duct plug type, with eye for tying rope and tape.
2. Manufacturers:
a. Carlon Telecom Systems Universal Blank Duct Plugs, Simplex, Triplex and Quadplex Duct Plugs
b. Condux International, Inc.
c. Monarch Duct & Conduit Duct Plugs and Multistep Cap Ends
d. GS Industries of Bassett, LLC Expandable Watertight Plugs
e. Or equal.

E. Line Marker Post
1. Orange polyethylene, post height 4 feet above surface.
2. Soil anchor.
3. Manufacturers:
a. Carlon Telecom Systems.
b. Vikimatic
c. Or equal.

F. Conduit Spacer, Trench
1. Construction
a. Non-metallic.
b. Sized to snap around conduits as shown on Drawings.
c. Interlocking.
2. Manufacturers:
a. Underground Devices Wunpeece.
b. GS Industries of Bassett, LLC Underground Products Spacer System.
c. Armorcast Products Company
d. Carlon Snap-Loc Spacers
e. or equal

G. Pulling In Irons
1. 7/8" Diameter
a. 6" exposed length minimum after embedment
b. RUS approved
2. Manufacturer
a. Cooper Power Systems
b. Or equal by listed vault or maintenance hole manufacturer
c. Or equal.

H. Cable Racks & Supports
1. Construction:
a. 12" minimum rack arms
b. Snap into vertical strut sections provided with new manhole, pullboxes and vaults, or into Owner’s existing vaults, where indicated.
2. Approvals
a. RUS

b. NEMA
3. Manufacturers:
a. Oldcastle
b. Underground Devices
c. or equal

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Refer to the most restrictive of the Code, the manufacturer's instructions, these specifications and the relevant CalTrans, NEMA or RUS guidelines and conform.

3.2 CONDUIT APPLICATION

A. General: Install the following types of conduits and fittings in the locations listed, unless otherwise noted in the drawings:
1. Underground Ductbanks, Concrete Encased
a. PVC

B. Exterior, Exposed:
1. Type RSC for applications up to 8 feet AFF or to first pull box, whichever is first, applications subject to physical abuse or for applications greater than 4" diameter.
2. EMT acceptable in all other applications not noted above up to 4", where used in conjunction with specified Raintight (compression) couplers.

C. Embedded in Concrete
1. RSC or rigid non-metallic conduit.
2. PVC

D. In Utility Tunnels
1. RSC
2. CRSC
3. IMC

3.3 UNERGROUND VAULT APPLICATION

CONDITION	**ACCEPTABLE VAULT CONSTRUCTION STANDARD**		
	AASHTO H-20	**ANSI /SCTE 77 2007 TIER 22**	**PEDESTRIAN/PARK WA Y ANSI /SCTE 77 2007 TIER 8**
PEDESTRIAN PATHWAYS.	**YES**	**YES**	**YES**

AT UNPAVED ROADS SUBJECT TO INFREQUENT VEHICLE TRAFFIC.	**YES**	**YES**	**NO**
AT PAVED ROADS AND AT PAVED SURFACES ORDINARILY EXPOSED TO MOTOR VEHICLE TRAFFIC.	**YES**	**NO**	**NO**

3.4 UNDERGROUND CONSTRUCTION:

A. Duct and Conduit Placement.

1. Duct lines shall have a continuous slope downward toward underground structures and away from buildings with a minimum pitch of 3 inches in 100 feet.
2. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes.
3. Excavate trenches along straight lines from structure to structure before ducts are laid or structure constructed so the elevation can be adjusted, if necessary, to avoid unseen obstruction.
4. Except at conduit risers, accomplish changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger.
5. Short-radius manufactured 90-degree duct bends may be used only for building, pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured

   bend radius shall be 18 inches for ducts of less than 80 mm 3 inch diameter, and 36 inches for ducts 80 mm 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of m 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used.

B. Duct Bank.

1. Duct Entrance Arrangement - Conform to Table 3.33 and applicable arrangement diagrams 3.67-3.74 of 2004 BISCI Customer Owned

Outside Plant Design Manual.

2. Terminate ducts in end-bells where duct lines enter underground structures.

3. Stagger duct joints by rows and layers to strengthen the duct bank.

4. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers and top spacers to provide a completely enclosed and locked-in duct bank. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of duct bank. Before pouring concrete or backfilling, as applies, anchor duct bank assemblies to prevent the assemblies from floating. Anchoring shall be done by driving reinforcing rods adjacent to every other duct spacer assembly and attaching the rod to the spacer assembly.

5. Partially Completed Duct Banks. Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. During construction wherever a construction joint is necessary in a duct bank, prevent debris such as mud, sand and dirt from entering ducts by providing suitable duct plugs. Fit concrete envelope of a partially completed duct bank with reinforcing steel extending a minimum of 2 feet back into the envelope and a minimum of 2 feet beyond the end of the envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately 1 foot apart. Restrain reinforcing assembly from moving during concrete pouring.

6. As each section of a duct line is completed from structure to structure, for duct sizes 3 inches and larger draw a flexible testing mandrel approximately 12 inches long with a diameter less than the diameter of the duct through a duct. After which, draw a stiff bristle brush having the same diameter of the duct through the duct, until duct is clear of particles of earth, sand, and gravel; then immediately install end plugs. For duct sizes less than 3 inches, draw a stiff bristle brush through the duct, until duct is clear of particles of earth, sand, and gravel; then immediately install end plugs.

7. Field cuts requiring tapers shall be made with proper tools and match factory tapers.

8. Joints shall be staggered at least 6 inches vertically. Plastic Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

9. A coupling recommended by the duct manufacturer shall be used

whenever an existing duct is connected to a duct of different material or shape.

10. Unless otherwise noted, exterior communications duct runs shall be buried a minimum of 30" below finished grade or as required to conform to local utility requirements, whichever is greater.

11. Refer to the details in the plans for additional depth required for PDS communications duct construction.

12. Where new trenching is required, backfill and compaction requirements shall be as defined Division 33.

13. Ducts shall be provided with end bells whenever duct lines terminate in manholes or handholes.

14. Provide concrete encasement of all communications duct runs. Construct underground duct lines of individual ducts encased in concrete. Do not mix different kinds of duct in any one duct bank. Ducts shall not be smaller than shown. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 2 inches, except separate light and power conduits from communications ducts by a minimum concrete thickness of 4 inches. The top of the concrete encasement shall not be less than 18 inches below grade except that under roads and pavement concrete be a minimum of 24 inches below grade.

    a. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. Submit proposed bonding method for approval in accordance with the detail drawing portion of the submittals.

C. Where duct runs under existing roads, cut and patch the pavement as indicated on the Civil Plans.

D. Conduit Plugs and Pull Rope. New conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weephole or screen to allow water drainage. Provide a 3/8 inch nylon pull rope having 3 feet of slack at each end of unused or empty conduits.

E. Manhole Placement and Connections
    1. In unpaved areas, the top of new manhole covers shall be approximately 1/2 inch above the finished grade.
    2. Where existing grades that are higher than finished grades are encountered, concrete assemblies designed for the purpose shall be

installed to elevate temporarily the manhole cover to existing grade level.

3. All duct lines entering manholes must be installed on compact soil or otherwise supported when entering a manhole to prevent shear stress on the duct at the point of entrance to the manhole.
4. Duct lines entering precast concrete manholes through a precast knockout penetration shall be grouted tight with a portland cement mortar. PVC duct lines entering precast manholes through a PVC endbell shall be solvent welded to the endbell.
5. A cast metal grille-type sump frame and cover shall be installed over the manhole sump.
6. Connections to Existing Manholes. For duct line connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and bend out to tie into the reinforcing of the duct line encasement. Chip out the structure wall to form a key for the duct line encasement. Grout new bell end entries watertight to the formed opening.

F. Mark locations of future provision underground raceways by pre-cast reinforced concrete pullbox set flush in ground with stamped brass disk identification plate tied to conduit end with “Ty-Wrap”, “Quick-Wrap” or equal.

G. In existing facilities underground construction, the Contractor shall promptly repair any indicated utility lines or systems damaged by Contractor operations. Damage to lines or systems not indicated, which are caused by Contractor operations, shall be brought to the immediate attention of the Owner’s Representative. If the Contractor is advised in writing of the location of a non-indicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In any event, the Contractor shall immediately notify the Owner’s Representative of any such damage.

H. At twelve inches below grade, place specified warning tape continuously.

****

SECTION 27 05 53

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, and equipment required for permanent intelligible labeling on, or adjacent to, all cabling, connectors, innerduct, faceplates, jacks, receptacles, controls, fuses, circuit breakers, patching jacks, and racks.

B. This section includes minimum requirements for the following:

1. Labeling Communications Cabling
2. Labeling Closet Hardware
3. Labeling Work Stations
4. Labeling Pathways, Spaces, Grounding and Bonding

C. Refer to detailed plans for additional requirements.

D. Clearly and distinctly indicate the function of the item.

E. Coordinate with Record Drawings

1.2 REFERENCES

A. Usage: In accordance with Division 1.

B. American Society for Testing and Materials (ASTM)

1. ASTM D 709(2001) Laminated Thermosetting Materials

C. Telecommunications Industry Association (ANSI/TIA)

1. ANSI/TIA-606-B (2012) Administration Standard Telecommunications Infrastructure

D. Underwriters Laboratories (UL)

1. UL 969 (1995; R 2001) Marking and Labeling Systems

1.3 QUALITY ASSURANCE

A. Identification and administration work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA- 606-B (2012) Administration Standard Telecommunications Infrastructure
   2. ANSI/TIA-569C (2012) Telecommunications Pathway and Spaces
   3. ANSI/TIA- 568-C (2009)Telecommunications Cabling Standard.
   4. BICSI Telecommunications Distribution Methods Manual. 5. UL 969.

1.4 SUBMITTALS

A. Conform with the requirements of Section 01 3323 - Shop Drawings, Product Data and Samples and Section 27 0500 - Common Work Results for Communications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1

1.6 SEQUENCING

A. Not Used.

PART 2 - PRODUCTS

2.1 COMMUNICATION CABLING LABELS, INTERIOR

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Provide vinyl substrate with a white printing area and black print. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow - so that the labels are easily distinguishable.

D. Shall be flexible vinyl or other substrates to apply easy and flex as cables are bent.

E. Shall use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.

F. Manufacturers:

1. Cable Type - Silver Satin

    a. Brady TLS2200 labels - PTL-31-427, PTL-32-427
    b. Brady Laser tab labels - LAT-18-361, LAT-53-361
    c. Hubbell
    d. Leviton
    e. Panduit.
    f. or equal.

2. Cable Type - 4 pair UTP

    a. Brady TLS2200 labels - PTL-31-427,PTL-32-427
    b. Brady Laser tab labels - LAT-18-361, LAT-53-361
    c. Hubbell
    d. Leviton
    e. Panduit.
    f. or equal.

3. Cable Type - 4 pair STP

    a. Brady TLS2200 labels - PTL-21-427
    b. Brady Laser tab labels - LAT-19-361
    c. Hubbell
    d. Leviton
    e. Panduit.
    f. or equal.

4. Cable Type - 25 pair copper

    a. Brady TLS2200 labels - PTL-21-427
    b. Brady Laser tab labels - LAT-19-361
    c. Panduit.
    d. or equal.

5. Cable Type - 50 pair copper

    a. Brady TLS2200 labels - PTL-33-427
    b. Panduit.
    c. or equal.

6. Cable Type - 100 pair copper

    a. Brady TLS2200 labels - PTL-34-427
    b. Brady
    c. Panduit.

d. or equal.

7. Cable Type - 2 strand fiber

   a. Brady TLS2200 labels - PTL-19-427
   b. Brady Laser tab labels- LAT-17-361
   c. Panduit.
   d. or equal.

8. Cable Type - 4-12 strand fiber

   a. Brady TLS2200 labels - PTL-21-427
   b. Brady Laser tab labels - LAT-19-361
   c. Panduit.
   d. or equal.

9. Cable Type - RG-6 Coax

   a. Brady TLS2200 labels - PTL-31-427, PTL-32-427
   b. Brady Laser tab labels -LAT-18-361, LAT-53-361
   c. Panduit.
   d. or equal.

10. Cable Type - RG-59 Coax

    a. Brady TLS2200 labels - PTL-31-427, PTL-32-427
    b. Brady Laser tab labels - LAT-18-361, LAT-53-361
    c. Panduit.
    d. or equal.

11. Cable Bundles

    a. Brady TLS2200 labels - PTL-12-109
    b. Panduit.
    c. or equal.

2.2 COMMUNICATIONS CABLE LABELS, OUTSIDE PLANT

A. Cable Tags in Manholes, Handholes, and Vaults

1. Provide tags for communications cable or wire located in manholes, handholes, and vaults.
   a. The tags shall be polyethylene.
   b. Machine printed - Do not provide handwritten letters.

2. Polyethylene Cable Tags

a. Provide tags of polyethylene that have an average tensile strength of 22.4 MPa (3250 pounds per square inch) 3250 pounds per square inch; and that are two millimeter (0.08 inch) 0.08 inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C 170 degrees F.
b. Provide 1.3 mm (0.05 inch) 0.05 inch (minimum) thick black polyethylene tag holder.
c. Provide a one-piece nylon, self-locking tie at each end of the cable tag.
d. Ties shall have a minimum loop tensile strength of 778.75 N (175 pounds) 175 pounds. The cable tags shall have black block letters, numbers, and symbols 25 mm (one inch) one inch high on a yellow background.
e. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

3. Manufacturers:

a. Panduit
b. Brady
c. or equal.

2.3 CLOSET HARDWARE LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Where insert type labels are used provide clear plastic cover over label.

D. Manufacturer:

1. Copper Patch Panels

a. 4 port group

1) Brady Laser tab labels - 2.8” x 0.375” (71.12mm x 9.52mm), LAT 43-707
2) Hubbell XPLPPA series
3) Leviton
4) Panduit.
5) or equal.

b. 6 port group
1) Brady Laser tab labels - 3.6” x 0.375” (91.44mm x 9.52mm), LAT-44-707

2) Hubbell
3) Leviton
4) Panduit.
5) or equal.

c. Individual port
1) Brady
a) TLS2200 labels - 0.5” x 0.375” (12.70mm x 9.52mm) white, PTL-44-422
b) Laser tab labels - 0.5” x 0.375” (12.70mm x 9.52mm) white, LAT-45-707
c) TLS2200 labels - 0.5” x 0.375” (12.70mm x 9.52mm) clear, PTL-44-430
d) Laser tab labels - 0.5” x 0.375” (12.70mm x 9.52mm) clear, LAT-45-712
e) TLS2200 labels - 0.5” x 0.5” (12.70mm x 12.70mm) white, PTL-7-422
f) Laser tab labels - 0.5” x 0.5” (12.70mm x 12.70mm) white, LAT-46-707
g) TLS2200 labels - 0.5” x 0.5” (12.70mm x 12.70mm) clear, PTL-7-430
h) Laser tab labels - 0.5” x 0.5” (12.70mm x 12.70mm) clear, LAT-46-712
2) Hubbell
3) Leviton
4) Panduit.
5) or equal

d. Patch Panel Name Label.
1) Hubbell XOLPPID Series
2) Brady
3) Leviton
4) Panduit
5) or equal.

2. Non-keystone based fiber patch panels
a. Hubbell XPLFOSEPAW
b. Brady
c. Leviton
d. Panduit
e. as provided with Patch Panel by the manufacturer
f. or equal.

3. 110 blocks
a. Brady Laser tab labels - 7.9” x 0.475” (200.6mm x 12.07mm), LAT-177-124
b. Hubbell XPL110 series.
c. Leviton
d. Panduit.

e. or equal.

2.4 GROUNDING AND BONDING, PATHWAY, AND SPACE LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Manufacturers:

1. Brady Corporation

a. TLS2200 labels

1) PTL-20-422, Size 2.0” x 1.0” (50.80mm x 25.40mm)
2) PTL-22-422, Size 3.0” x 1.0” (76.20mm x 25.40mm)
3) PTL-37-422, Size 3.0” x 1.9” (76.20mm x 48.26mm)
4) PTL-23-422, Size 4.0” x 1.0” (101.60mm x 25.4mm)
5) PTL-38-422, Size 4.0” x 1.0” (101.60mm x 25.4mm)

b. Laser tab labels

1) LAT-13-747, Size 1.875” x 0.833” (47.63mm x 21.16mm)
2) LAT-24-747, Size 1.75” x 1.0” (44.45mm x 25.40mm)
3) LAT-32-747, Size 3.0” x 0.9 “ (76.20mm x 22.86mm)
4) LAT-33-747, Size 2.0” x 1.437” (50.80mm x 36.50mm)
5) LAT-34-747, Size 3.0” x 1.437” (76.20mm x 36.50mm)

c. Continuous tape for TLS2200

1) PTL-8-422, Size 0.5” (12.70mm) white polyester
2) PTL-8-430, Size 0.5” (12.70mm) clear polyester
3) PTL-8-439, Size 0.5” (12.70mm) white vinyl
4) PTL-42-439, Size 1.0” (25.4mm) white vinyl
5) PTL-43-439, Size 1.9” (48.26mm) white vinyl

2. Panduit.

3. or equal.

2.5 WORKSTATION LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Where insert type labels are used provide clear plastic cover over label.

D. Manufacturers:

1. Brady Corporation
   a. Desi-strip inserts
      1) TLS2200 labels -1.9”x0.375”(48.26mmx9.52mm) white, PLT-40-412
      2) Laser tab labels -1.9”x0.375”(48.26mmx9.52mm) white, LAT-176-124
   b. Location ID
      1) TLS2200 labels - 1.0” x 0.375” (25.40mm x 9.52mm) white, PTL-16-422
      2) Laser tab labels -1.0” x 0.375” (25.40mm x 9.52mm) white, LAT-47-707
      3) TLS2200 labels- 1.0” x 0.375” (25.40mm x 9.52mm) clear, PTL-16-430
      4) Laser tab labels -1.0” x 0.375” (25.40mm x 9.52mm) clear, LAT-8-712 5) TLS2200 labels- 1.0” x 0.5” (25.40mmx 12.70mm) white, PTL-17-422
      5) Laser tab labels -1.0” x 0.5” (25.40mm x 12.70mm) white, LAT-7-707 7) TLS2200 labels- 1.0” x 0.5” (25.40mm x 12.70mm) clear, PTL-17-430
      6) Laser tab labels- 1.0” x 0.5” (25.40mm x 12.70mm) clear, LAT-7-712 9) TLS2200 labels- 1.5” x 0.375” (38.10mm x 9.52mm) white, PTL-45-422 10) Laser tab labels- 1.5’ x 0.375” (38.10mm x 9.52mm) white, LAT-47-707 11) TLS2200 labels- 1.5” x 0.375” (38.10mm x 9.52mm) clear, PTL-45-430 12) Laser tab labels-1.5” x 0.375” (38.10mm x 9.52mm) clear, LAT-47-712 13) TLS2200 labels- 1.5” x 0.5” (38.10mm x 12.70mm) white, PTL-29-422
      7) Laser tab labels- 1.5” x 0.5” (38.10mm x 12.70mm) white, LAT-47-707 15) TLS2200 labels- 1.5” x 0.5” (38.10mm x 12.70mm) clear, PTL-29-430
      8) Laser tab labels-1.5” x 0.5” (38.10mm x 12.70mm) clear, LAT-47-712
   c. Outlet/Jack ID
      1) TLS2200 labels -0.5” x 0.375" (12.70mm x 9.52mm) white, PTL-44-422
      2) Laser tab labels - 0.5” x 0.375” (12.70mm x 9.52mm) white, LAT-45-707 3) TLS2200 labels - 0.5” x 0.375” (12.70mmx 9.52mm) clear, PTL-44-430

3) Laser tab labels -0.5” x 0.375” (12.70mmx 9.52mm) clear, LAT-45-712 5) TLS2200 labels - 0.5” x 0.5” (12.70mm x 12.70mm) white, PTL-7-422

4) Laser tab labels- 0.5” x 0.5” (12.70mm x 12.70mm) white, LAT-46-707 7) TLS2200 labels - 0.5” x 0.5” (12.70mm x 12.70mm) clear, PTL-7-430

5) Laser tab labels - 0.5” x 0.5” (12.70mm x 12.70mm) clear, LAT-46-712

d. General Use Labels

1) TLS2200 labels - 0.375” (9.52mm) cont. white, PTL-46-422 2) TLS2200 labels - 0.375” (9.52mm) cont. clear, PTL-46-430

2. Hubbell

a. Location ID

1) Desi-Strip Style

a) XPLFP10W

2) Adhesive

a) XPLFPA10W, XPLFPA10W,

b. Outlet/Jack ID

1) XPLIPA10W, XPLIPA10C

3. Leviton

4. Panduit.

5. or equal.

2.6 NAMEPLATES

A. Field Fabricated Nameplates

1. Features/Function/Construction

a. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
b. Comply with ASTM D 709.
c. Each nameplate inscription shall identify the function and, when applicable, the position.
d. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core.
e. Surface shall be matte finish.

f. Corners shall be square.
g. Accurately align lettering and engrave into the core.
h. Minimum size of nameplates shall be one by 2.5 inches.
i. Lettering shall be a minimum of 0.25 inch high normal block style

PART 3 - EXECUTION

3.1 GENERAL

A. Apply labeling to clean surfaces free of oil, dust, solvents or loose material.

B. Apply after Project painting in area of application is complete.

C. All labels shall be machine/printer created labels.

D. Apply to locations where labeling will not be damaged, covered over or in the way of the ordinary maintenance and operation of the installed communications infrastructure or system.

E. Apply labeling right side up, parallel to major edges of surfaces to which it is applied. When no line is evident, apply parallel to floor line. Correct conditions of labeling applied out of true.

F. Protect installed labeling from damage.

G. Replace labeling that is defaced, illegible or peeling off of the surface to which it is applied.

3.2 WORKSTATION JACK, CABLE AND PATCH PANEL ASSIGNED CIRCUIT NUMBERS

A. Label General: WAO jack assignment number and patch panel port number shall be the same number.

B. Station cable numbers shall be in the following format

1. XXX.YYY.PZZ, where:

   a. XXX = IDF Number/MDF
   b. YYY = Room Number
   c. PZZ = Port Number:

2. Example 1: Port 5 in Room 106 connected to the MDF == MDF.106.P05
3. Example 2: Port 2 in Room 212 connected to IDF 6 == 6.212.P02

C. The cover plate area directly above and beneath the jacks are the

labeling areas. In the top area, using the specified means, label the faceplate number assigned on the contract documents.

3.3 IDENTIFICATION & LABELING

A. Pathways

1. Pathways shall be marked at each endpoint and at all intermediate pull or junction boxes. In the case of partitioned pathways (i.e. innerduct) each partition shall have a unique identifier.
2. Label pathways using the appropriate abbreviation and a number.
3. Use adhesive type labels.

B. Labels shall be affixed at the entry to all telecommunications rooms and spaces (Includes entrance facilities, communication equipment rooms, communication equipment spaces and work areas)

1. Use adhesive type labels for all communications space labeling,
2. Affix labels to entrance doors - coordinate location with Owner's Representative.

C. Cables

1. Horizontal and Indoor Backbone Cables shall be marked within 12" of each endpoint or to innerduct in which the cable is installed.
2. Except where installed in innerduct or conduit, all backbone fiber optic cable shall have affixed to the outer jacket, labels of a bright color that contain at least the legend "FIBER OPTIC CABLE." These labels must be affixed at separations no greater than 50 ft.
3. Within every manhole/vault/pullbox and within 4 ft of the entrance into a building every backbone cable's assigned identifier shall be affixed to either the cable's outer jacket or to innerduct in which the cable is installed.
4. Any cable installed in conduit shall be labeled at all intermediate pull or junction boxes.
5. Label cables using the appropriate circuit ID.
6. Use adhesive type labels for all communications cable labels.
7. Affix labels to cables - marking cable is not permitted.
8. Where cable is fully encased in innerduct label the outside of the innerduct with the cable label and, where the contents are fiber optic cabling, the "FIBER OPTIC CABLE" label.

D. 110 blocks

1. Each cable termination position on 110 blocks shall be labeled with number designators.

a. All backbone copper cable termination blocks shall be labeled with both the pair count of every 5th pair and the cable's assigned identifier.

2. Where insert type labels are used install clear plastic cover over reprinted or Laser printed type label. Install five (5) pair and four (4) pair 110 I.D. strips for backbone cabling.

   a. Owner's Representative to provide Owner generated cable number.

3. Pair call-out labeling: Pair call-out labeling shall designate every fifth (5th) pair consecutively through total pair count of the cable terminated on the block but not including the first (1st) and twenty-fifth (25th) pairs of each twenty-five (25) pair field bundle: Example for fifty (50) pair cable -- 5, 10, 15, 20, 30, 35, 40, 45.

E. Backbone Fiber Patch Panel Labeling

1. Each backbone fiber patch panel shall have a header label.

   a. Header Label format and content shall be as follows:

      1) OWNER generated cable number.
      2) 'From' Owner building Telecommunication Room (TR) number for ISP riser or 'From' Owner building number for OSP cable.
      3) Fiber strand type designation and strand count. SM (single mode) XX; MM (multi-mode) XX where XX = strand count. If cable is a hybrid make sure both strand type counts are accounted for in header label.

   b. Owner's Representative to provide Owner generated cable number.
   c. Fiber Patch Panel Port Labeling: Label each fiber patch panel port with the strand count terminated on the port. Example for a duplex port termination: 5-6 = strand 5 and strand 6 of cable are terminated on this fiber patch panel port. Simplex port termination 6 = strand 6 is of cable is terminated on this fiber patch panel port.
   d. All labels shall be printed labels. Hand labeling is not acceptable unless approved in writing as acceptable by the PP&C project manager or his/her designate.

F. Voice Cross-Connect System Labeling

1. The 110-Blocks shall be labeled "Voice Cross-Connect to Rack #_ Panel # ". Each cable shall be numbered from 1-48 on the 110-block Designation Strips.
2. The patch panels on the racks shall be labeled "Voice Cross-Connect Rack #_ Panel # ". Each jack shall be numbered from 1-48 on each panel.

G. Workstations

1. All faceplate labels shall indicate the faceplate number and the circuit ID for each cable that it houses
2. For faceplates where insert type labels are used install clear plastic cover over preprinted or Laser printed type label.
3. For faceplates without insert type labels use adhesive type labels affix labels to faceplate - marking faceplates is not permitted.
4. Patch cords cords installed under the work of this Project shall be labeled at each endpoint using the appropriate circuit ID.
5. Use adhesive type labels for all communications cable labels.
6. Affix labels to cables - marking cable is not permitted.

H. Grounding and Bonding

1. The TMGB(s) (telecommunications main ground bar) shall be labeled as such with an adhesive type label(s) affix label(s) to TMGB.
2. The conductor connecting the TMGB (telecommunications main ground bar) to the building ground shall be labeled at each end with an affixed label in a visible location as close as practicable to the bonding point at each end of the conductor.

I. Firestopping

1. Each firestopping location shall be labeled at each location where firestopping is installed, on each side of the penetrated fire barrier, within 300 mm (12 in.) of the firestopping material.

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SECTION 27 10 00

STRUCTURED CABLING, BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section defines commons means and methods for the work of the following Sections:

1. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures
2. Section 27 1119 - Communications Termination Blocks and Patch Panels
3. Section 27 1123 - Communications Cable Management
4. Section 27 1300 - Communications Interior Backbone Cabling
5. Section 27 1500 - Communications Horizontal Cabling

1.2 RELATED DOCUMENTS

A. Section 27 05 00 - Common Work Results for Communications applies to the work of this Section.

1.3 REFERENCES

A. Usage: In accordance with Division 1.

B. In Addition to the requirements of Section 27 05 00 - Common Work Results for Communications, conform to the applicable portions of the following standards agencies:

1. American Society For Testing and Materials (ASTM)

    a. ASTM A228/A228M-02 Steel Wire, Music Spring Quality.

2. Bellcore

    a. TR-NWT-000253Intermediate Reach, 1, OC3

3. Federal Communications Commission (FCC)

    a. The Code of Federal Regulations, Title 47, Telecommunications, Chapter 1 - FCC Part 68 (1982 issue or

latest revision) (47 CFR 68).

4. Institute of Electrical and Electronic Engineers

   a. IEEE 383-2003 Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations
   b. IEEE 100-00 The Authoritative Dictionary of IEEE Standards Terms

5. Insulated Cable Engineers Association (ICEA)

   a. ICEA S-56-434 (1983, 5th Ed.) Reaffirmed October 18, 1991 Polyolefin Insulated Communication Cables for Outdoor Use.
   b. ANSI/ICEA S-83-596-2011 Indoor Optical Fiber Cables
   c. ANSI/ICEA S-84-608-2010 Telecommunications Cable, Filled Polyolefin Insulated Copper Conductor
   d. ANSI/ICEA S-86-634-2011 Buried Distribution & Service Wire, Filled Polyolefin Insulated, Copper Conductor.
   e. ANSI/ICEA S-87-640-2011 Fiber Optic Outside Plant Communications Cable
   f. ICEA S-102-700-2004 - ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements
   g. ICEA S-103-701-2011 Riser Cables Technical Requirements

6. National Electrical Manufacturers Association (NEMA)

   a. NEMA WC 63.1(2000) Twisted Pair Premise Voice and Data Communications Cables

7. National Fire Protection Association (NFPA)

   a. NFPA 70 National Electrical Code

8. Telecommunications Industry Association (ANSI/TIA)

   a. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
   b. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009
   c. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, published 2009
   d. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, published 2008, including errata issued in October, 2008.

e. ANSI/TIA 569-C (2012) Telecommunications Pathways and Spaces
f. ANSI/TIA-606-B (2012) Administration Standard Telecommunications Infrastructure
g. ANSI- J-STD-607-B (2011) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

9. Underwriters Laboratories, Inc. (UL)

a. UL 444(2002; Bul. 2002, 2003) Communications Cables
b. UL 910(1998) Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
c. UL 1286(1999; R 2004) Office Furnishings
d. UL 1581 Reference Standard for Electrical Wires, Cables, and Flexible Cords. Oct. 2001
e. UL 1666(2000; R 2002) Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
f. UL 1863(2000; R 2004) Communications Circuit Accessories

1.4 DEFINITIONS

A. Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009
2. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009
3. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, published 2009
4. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, published 2008, plus errata issued in October, 2008.
5. ANSI/TIA-606-B (2012) Administration Standard Telecommunications Infrastructure
6. IEEE Std 100 and
7. Section 27 05 00
8. As defined in this Section.

1.5 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 05 00 - Common Work Results for Communications.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of Division 1, Section 27 05 00 - Common Work Results for Communications and the following:

B. Shipping Conditions:

1. All cable shall be shipped on reels or manufacturer supplied “handy boxes”.
2. The diameter of the drum shall be at least 13 times the diameter of the cable.
3. The reels shall be substantial and so constructed as to prevent damage during shipment and handling.
4. Secure the outer end of the cable to the reel head so as to prevent the cable from becoming loose in transit.
5. Project the inner end of the cable into a slot in the side of the reel, or into a housing on the inner slot of the drum, in such a manner and with sufficient length to make it available for testing.
6. The inner end shall be fastened so as to prevent the cable from becoming loose during installation. End seals shall be applied to each of the cables to prevent moisture from entering the cable.

C. Storage:

1. Do not roll or store cable reels without an appropriate underlay.
2. Retain factory cable protection until installation. Supplement with heavy gauge plastic sheeting if factory protective membrane is pierced prior to installation. Tape ends and seams water and dust tight.
3. The reels with cable shall be suitable for outside storage conditions when the temperature ranges from minus 40 degrees C to plus 65 degrees C, with relative humidity from 0 to 100 percent.
4. Protect cable reels from physical damage from site construction vehicles or from settling into the soil.
5. Equipment, other than outside plant rated cable protected with fully watertight cable caps, to be delivered and placed in storage, suitably protected from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

D. Handling

1. Cabling other than outside plant cabling exposed to standing water or other liquids at any time during storage, delivery or placement shall be replaced at no expense to the Owner.
2. Cut ends of outside plant rated cabling or portions of outside plant rated cable with a damaged jacket shall not be exposed to standing water or other liquids at any time during storage, delivery or placement. Where such conditions occur, the Owner's representative

may require that the cable be replaced at no cost to the Owner.

1.7 SEQUENCING

A. Not Used.

1.8 PERFORMANCE STANDARDS

A. Telephone (Voice) Copper Cabling Plant:

1. Suitable for direct connection to the Public Switched Network in accordance with rules set forth by FCC Part 68, California Public Utilities Commission, and other Authorities Having Jurisdiction.
2. Includes Category 5e outside plant cabling (UTP5e-4OP) used as low pair count outside plant voice cabling.

B. Horizontal (Station) Category 6 Copper Cabling - Permanent Link

1. Testing shall commence while the Owner's equipment in the area of service is operational and creating worst case emissions associated with its operation while in good working order. Every effort shall be made to include worst case influence on the materials install shall be taken.
2. In accordance with the field test specifications defined in ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard”, every horizontal Cat6 station cabling link in the project shall be tested for:

    a. Wire Map
    b. Length
    c. Insertion Loss
    d. NEXT Loss
    e. PS NEXT Loss
    f. ACR-F Loss
    g. PS ACR-F Loss
    h. Return Loss
    i. Propagation Delay
    j. Delay Skew

3. Using the listed Category 6 cable test set, test installed cabling using Permanent Link procedure and submit report demonstrating that the link meets the following parameters:

FREQUENCY (MHZ)	INSERTION LOSS	NEXT (WORST PAIR TO PAIR)	POWER SUM NEXT	ELFEXT (WORST PAIR TO PAIR)	POWER SUM ELFEXT	RETURN LOSS
1.0	2.0	79.3	77.3	72.8	69.8	20.0
4.0	3.8	70.3	68.3	60.7	57.7	23.6
10.0	5.9	64.3	62.3	52.8	49.8	26.0
16.0	7.5	61.3	59.3	48.7	45.7	26.0
20.0	8.4	59.8	57.8	46.7	43.7	26.0
31.3	10.6	56.9	54.9	42.9	39.9	25.0
62.5	15.3	52.4	50.4	36.8	33.8	23.5
100.0	19.7	49.3	47.3	32.8	29.8	22.5
150.0	24.7	48.7	44.7	29.3	26.3	21.6
200.0	29	44.8	42.8	26.8	23.8	21.0
250.0	32.6	43.3	41.3	24.8	21.8	20.5

A. Each permanent link shall demonstrate a positive PSACR beyond 350 MHz to meet and exceed the bandwidth requirements of TIA-568-C.2 Category 6 standards. Each permanent link shall demonstrate 2 dB of cross talk headroom over TIA-568-C.2 Category 6 standard for NEXT, PSNEXT, ELFEXT and PSELFEXT bit error rate.

1. Report whether tested link passes or fails
2. Note exceptions to required Category standards. Remedy and retest

B. Category 6A Station Cabling Performance Testing

1. General Requirements

a. In accordance with the field test specifications defined in ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard” (TIA Cat 6A Standard), every Cat 6A cabling link in the installation shall be tested for:
b. Wire Map
c. Length
d. Insertion Loss
e. NEXT Loss
f. PS NEXT Loss
g. ACR-F Loss
h. PS ACR-F Loss
i. Return Loss
j. Propagation Delay

k. Delay Skew

2. In addition to testing the “In-link” performance parameters specified above, Alien Crosstalk testing or “Between-link’ testing shall be carried out in accordance with Section 4.7 of ANSI/TIA-1152. Alien crosstalk testing includes the PS ANEXT and PS AACR-F (Power sum alien attenuation-to-crosstalk ratio from the far end) performance parameters. The standards refer to the link-under-test for Alien Crosstalk as the disturbed link.
3. PS ANEXT and PS AACR-F shall meet or exceed the limits defined in Section 6 of the TIA Cat 6A Standard.

   a. Selection of disturbed links: 1 % of the links in the cabling installation or 5 links, whichever is more. Chose short, medium and long links equally.
   b. Selection of disturber links. Select all of the links that are in the same cable bundle and the most consistently positioned relative to the disturbed link as disturbing links.

4. If the margin of PS ANEXT and PS AACR-F exceeds 5 dB for the first three short, medium and long links (nine in total), further alien crosstalk testing can be discontinued.
5. The installed twisted-pair horizontal links shall be tested from the IDF in the telecommunications room to the telecommunication wall outlet in the work area for compliance with the “Permanent Link” performance specification as defined in the TIA Cat 6A Standard.
6. One hundred percent of the installed cabling links must pass the requirements of the standards mentioned in above and as further detailed below. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result

   of the tests for all links shall be provided in the test results documentation in accordance Section 27 05 00.
7. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).
8. The test equipment (tester) shall comply with the accuracy requirements for Level IIIe field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 4 of ANSI/TIA-1152.
9. The RJ45 test plug shall fall within the values specified in ANSI/TIA-

568-C Annex C for NEXT, FEXT and Return Loss.

10. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
11. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
12. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
13. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.
14. The Owner's Representative will select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored as specified herein above. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.
15. Performance Test Parameters.

    a. The test parameters for Cat 6A are defined in the TIA Cat 6A standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 500 MHz) must meet or exceed the limit value determined in the above-mentioned standard.

1) Wire Map. Shall report Pass if the wiring of each wire-pair from end to end is determined to be correct. The Wire Map results shall include the continuity of the shield connection if present.
2) Length. The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average value for Nominal Velocity of Propagation (NVP). The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for

   the Permanent Link configuration (90 meters - 295 feet) plus 10% to allow for the variation and uncertainty of NVP.
3) Insertion Loss (Attenuation). Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss.” Insertion Loss shall be tested from 1 MHz through 500 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT Loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results for the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which this worst case value occurs, and the test limit value at this frequency.
4) NEXT Loss. Pair-to-pair near-end crosstalk loss (abbreviated as NEXT Loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1 through 500 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT Loss measurements shall not exceed the maximum step size defined in the standard as shown in Table 1. . Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst case NEXT margin (2) and the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

Maximum frequency step size as defined in ANSI/TIA-1152	
Frequency Range (MHz)	**Maximum Step size (MHz)**
1 – 31.25	0.15
31.26 – 100	0.25
100 – 250	0.50
250 – 500	1.00

5) PS NEXT Loss. Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 500 MHz and the step size may not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS NEXT. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
6) ACR-F, pair-to-pair. Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured from 1 through 500 MHz and the maximum step size for FEXT Loss measurements shall not exceed the maximum step size defined in the standard as in Table 1. Minimum test results

   documentation (summary results): Identify the wire pair combination that exhibits the worst-case margin and the wire pair combination that exhibits the worst value for ACR-F. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
7) PS ACR-F Loss. Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the

FEXT disturbance from three wire pairs on the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 500 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

8) Return Loss. Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured form 1 through 500 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
9) Propagation Delay. Propagation delay is the time required for the signal to travel from one of the link to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
10) Delay Skew [as defined in the TIA Cat 6A Standard; Section 6.2.19] This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.
11) PS ANEXT. Pair-to-pair Alien NEXT (ANEXT) contributions is measured by applying the stimulus signal at the near end to one wire pair of a disturbing link and measuring the coupled signal at the near end of a wire pair in a disturbed link. This process is repeated for every wire pair in a disturbing link. The PS ANEXT for each wire pair in a disturbed link is obtained by the power sum addition of all the pair-to-pair ANEXT results to that wire pair from all wire pairs in disturbing links. All the links that are bundles with the disturbed link need to be included as

disturbing links. In addition, links that are terminated in adjacent positions in a patch panel or interconnect panel should also be included as disturbing links in this test.

a) Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS ANEXT. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

12) PS AACR-F. The pair-to-pair Alien Far End crosstalk (AFEXT) contributions is measured by applying the signal at the near end to one wire pair of a disturbing channel or permanent link and measuring the coupled signal at the far end of a wire pair in a disturbed channel or permanent link. This process is repeated for every wire pair in a disturbing link and for all links in close proximity. A normalization, which is dependent on the relative length of disturbing and disturbed link, is applied to each pair-to-pair alien FEXT measurement. Then the PS Alien Attenuation-to-Crosstalk Ratio from the Far end (PS AACR-F) for each wire pair in a disturbed channel or permanent link is obtained by the power sum addition of all the normalized pair-to-pair far end alien crosstalk results to that wire pair from all wire pairs in disturbing links in close proximity.

a) Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS AACR-F. If the link or channel connects two patch panels (data center), these wire pairs must be identified for the tests performed from both ends. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

b. Test Result Documentation

1) The test results/measurements shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time.
2) The database for the completed job shall be stored and delivered on CD-ROM or DVD or equivalent media selected by

the Owner's Representative, including the software tools required to view, inspect, and print any selection of test reports.

3) A PDF copy of the test results shall be provided that lists all the links that have been tested with the following summary information

   a) The identification of the link in accordance with the naming convention defined in the overall system documentation
   b) The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
   c) The date and time the test results were saved in the memory of the tester.

c. General Information to be provided in the electronic data base with the test results information for each link:

   1) The identification of the customer site as specified by the end-user
   2) The identification of the link in accordance with the naming convention defined in the overall system documentation
   3) The overall Pass/Fail evaluation of the link-under-test
   4) The name of the standard selected to execute the stored test results
   5) The cable type and the value of NVP used for length calculations
   6) The date and time the test results were saved in the memory of the tester
   7) The brand name, model and serial number of the tester
   8) The identification of the tester interface
   9) The revision of the tester software and the revision of the test standards database in the tester

d. In-link (In-Channel) detailed test results. The detailed test results data to be provided in the electronic database for must contain the following information:

   1) For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.
   2) Length: Identify the wire-pair with the shortest electrical

length, the value of the length rounded to the nearest 0.1 m and the test limit value

3) Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value
4) Delay Skew: Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value
5) Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair
6) Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link
7) NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link
8) PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link

e. Between-Link (Between-Channel) Test Results Data. A test report shall be provided for each disturbed link included in the Alien Crosstalk sample test. This test report must contain

1) PS ANEXT results at each frequency for each wire pair in a victim link as well as the PS ANEXT results for the average of these four wire pairs. The worst case margin and the worst values shall be provided for each wire pair and the average of the four wire pairs. PS ANEXT shall be measured and tested from the end of the link or channel where all cables are terminated at a distribution panel. In case the cabling runs from panel to panel (data center) where the worst case PS ANEXT margin is less than 2 dB, the PS ANEXT test results for each disturbed link shall be collected and saved from both ends (both panels) of the disturbed link.
2) PS AACR-F results at each frequency tested for each wire pair in a disturbed link as well as the PS AACR-F results for the average of the four wire pairs. The worst case margin and the worst values shall be provided for each wire pair and the average of the four wire pairs. PS AACR-F only needs to be measured and tested from one end of the link or channel.

C. Fiber Optic Cabling - as specified herein below.

1.9 TESTING

A. General

1. In addition to the tests detailed in this specification section, the contractor shall notify the Owner's Representative of any additional tests that are deemed necessary to guarantee a fully functional system. The contractor shall carry out and record any additional measurement results at no additional charge
2. Test and report on each intermediate cabling segment separately, including station cabling, horizontal distribution (each segment, if multiple) and telecommunications room wiring.
3. Test each end to end cable link.
4. Submit machine-generated documentation and raw data of all test results on Contractor-provided, and Owner's Representative approved, forms; and in electronic format approved by the Owner's Representative.
5. Provide machine-generated data on an appropriate disk media (CD-ROM CD-R format) to be transferred to the Owner's computers.

    a. Where the machine-generated documentation requires use of a proprietary computer program to view the data, provide the Owner with 1 licensed copy of the software.

6. Provide registered testing software used for the actual tests to the Owner for review of test data.

B. Test Equipment:

1. Provide in conformance with the applicable requirements of 27 05 00 - Common Work Results for Communications.
2. Test systems using at least one (1) each of the following test measurement devices or their functional equivalents:

    a. IEC Level V field tester: Fluke DSX-5000, Agilent or equal.

        1) The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
        2) The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling

on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction..

b. Outside Plant Voice Cabling Plant tester - capable of detecting shorts, opens, reversals, mis-wiring and crosstwists. (Siemon STM-8, Fluke or equal).
c. Tone Test Sets.
d. Optical Power Meter (Corning Cable Systems, Fluke DTX-1800 or equal)

    1) Power measurement uncertainty of ± 0.25 dB.
    2) Store reference power measurement.
    3) Save at least 100 results in internal memory.
    4) PC interface (serial or USB).
    5) Minimum Performance - Single Mode Power Meter

        a) 1300nm and 1500nm (± 20 nm) wavelength dual laser light sources.
        b) Output power of -10 dBm minimum
        c) Output Stability +/- 0.40 dB from 0 to 50 degrees C
        d) Long Term output stability +/- 0.10dB at 25 degrees C
        e) Measurement range shall be from 10 to -60 dBm
        f) Accuracy shall be +/- 5% at 0 to -50dBm and +/- 10% 10 to 0dBm and -50 to -60 dBm.
        g) Resolution shall be 0.1 dB
        h) Connector types shall include: LC, ST, SC.

e. Optical Time Domain Reflectometer. (Fluke, JDSU or equal).

    1) Singlemode OTDR

        a) Wavelengths of 1310 nm (± 20 nm) and 1550 nm (± 20 nm).
        b) Event deadzones of 3.5 m maximum at 1310 nm and 1550 nm.
        c) Attenuation deadzones of 10 m maximum at 1310 nm and 12 m maximum at 1550 nm.
        d) Distance range not less than 10000 m.
        e) Dynamic range at least 10 dB at 1310 nm and 1550 nm

f. Site portable communications systems (walkie-talkie, cell phone or similar).
g. Any other items of equipment or materials required to demonstrate conformance with the Contract Documents.

C. Station Wiring, General

1. Test station wire only after all pairs of station wire in a work area have been terminated at both ends, and no work of this Section or other Sections may cause physical disturbance to the wiring.
2. Correct any and all transpositions found. Retest.
3. If any conductor in a station wire tests either open or short, then the entire station wire is to be removed, replaced, and re-tested.

D. Category 6 Cabling.

1. Using the listed Category 6 cable test set, test and submit report on the parameters specified for Category 6 cabling in this Section. Report whether tested link passes or fails the Category 6 standards. Cables must pass TIA Permanent Link Certification for the cable type being installed. A "Marginal" test result will not be accepted.
2. Note exceptions to required Category standards. Remedy and retest.

E. Category 6A Cabling.

1. Using the listed Category 6A cable test set, test and submit report on the parameters specified for Category 6A cabling in this Section. Report whether tested link passes or fails the Category 6A standards. Cables must pass TIA Permanent Link Certification for the cable type being installed. A "Marginal" test result will not be accepted.
2. Note exceptions to required Category standards. Remedy and retest.

F. Telephone: Outside Plant, Inside Riser Wire:

1. General:

   a. A new cable shall be tested only after all wires within the cable have been terminated at both ends.
   b. For unshielded cable, "measurements to ground" means an electrical connection to the Telecommunications Ground Bus, building steel, electrical metallic conduit or a water pipe.
   c. The Contractor shall correct all defects possible.
   d. If the maximum number of unrepairable defective pairs exceeds 4% of the cable's pair count, the cable shall be deemed unacceptable and shall be replaced. Replace, re-terminate and retest new cable at no additional cost to the Owner.

2. Test procedures:

   a. TEST #1 - Continuity:

      1) Meter set for 20 ohm full scale ohm reading. Each pair shall be shorted at one end and the loop resistance value read at the other.

2) The difference between the largest and the smallest resistance reading from each pair in the cable shall be no more than 10 percent of the largest reading.

b. TEST #2 - Balance, Polarity and Conductor Transpositions:

1) Upon passing Test #1, the tester at one end of cable shall ground tip side of each pair in turn. The tester at other end of cable reads resistance to building ground of same conductor.

c. REQUIREMENT: Reading for each tip conductor in pair of approximately one-half the loop resistance value from Test #1.

3. Test Report:

a. Submit Test Report. Documentation shall include loop resistance regarding any opens, shorts, transpositions found, as well as corrective action taken to correct any found opens, shorts, or transpositions.

G. Fiber Optic Cabling.

1. Perform fiber optic cable testing on all installed fiber optic cabling. Submit test results.
2. All testing procedures and field-test instruments shall comply with applicable requirements of:

a. ANSI Z136.2, ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources
b. ANSI/EIA/TIA 455 50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements
c. ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.
d. ANSI/TIA/EIA 455 60A, Measurement of Fiber or Cable Length Using an OTDR.
e. ANSI/TIA/EIA 455 61A, Measurement of Fiber or Cable Attenuation Using an OTDR.
f. ANSI/TIA/EIA 526 7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant.
g. ANSI/TIA/EIA 526 14 A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
h. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises.
i. ANSI/TIA 568 C.3, Optical Fiber Cabling Components Standard.
j. ANSI/TIA-606-B (2012) Administration Standard

Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.

3. Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

    a. Manufacturer of the fiber optic cable and/or the fiber optic connectors.
    b. Manufacturer of the test equipment used for the field certification.
    c. Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)
4. Submit calibration certification for testing equipment to be used and certification of training of persons proposed to perform specified testing prior to scheduling testing.
5. The Owner's Representative shall be provided with the opportunity witness and/or review field-testing.
6. The Owner's Representative shall be notified of the start date of the testing phase five (5) business days before testing commences.
7. The Owner's Representative will select a random sample of 5% of the installed links. The Owner's Representative shall test these randomly selected links and the results are to be stored in the manner described in this section. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor shall repeat 100% testing at no cost to the Owner.
8. Submit test report no later than five days after the cables are tested.

1.10 ACCEPTANCE OF FIBER OPTIC TEST RESULTS

A. Each cabling link shall be in compliance with the following test limits:

1. Optical loss testing

    a. Singlemode links

        1) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.

            a) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
            b) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length

(Km)

c) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
d) Maximum allowable connector_loss = 0.4 dB
e) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
f) Maximum allowable splice_loss = 0.05 dB
g) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

2. OTDR Testing. Not required if fiber passes required optical loss testing.

   a. Reflective events (connections) shall not exceed 0.4 dB.
   b. Non-reflective events (splices) shall not exceed 0.05 dB.

B. All installed cabling links shall be field-tested and pass the test requirements and analysis as described in Part 3. Any link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link meets performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Part 3.

C. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

PART 2 - PRODUCTS

2.1 COMMUNICATIONS CABLES AND RELATED

A. GENERAL:

1. Cabling shall be UL listed for the application and shall comply with TIA-568-C.1, TIA-568-C.2, TIA-568-C.3 and NFPA 70.
2. Ship cable on reels and/or in boxes bearing manufacture date for UTP in accordance with ICEA S-90-661 and optical fiber cables in accordance with ICEA S-83-596 for all cable used on this project.
3. Cabling manufactured more than 12 months prior to date of installation shall not be used.

4. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.

    a. At plenums, provide type CMP or OFNP cabling.
    b. At risers, provide type CMR or OFNR cabling
    c. At horizontal wiring conditions, provide type CM or OFN cabling.

5. Refer to Section 27 14 00 - Communications Outside Plant Backbone Cabling for underground cabling installation

2.2 FIBER OPTIC CABLING, GENERAL REQUIRMENTS

A. General

1. Fiber count per cable to comply with minimum counts indicated on the plans. Plans indicate specific cable counts providing quantities of single mode fiber strands.
2. Quantities are minimum quantities. At Contractor's option, provide a greater number. Where a greater number are provided, terminate, test, label and document all strands on fiber patch panels and/or terminal boxes as indicated as if quantity provided were called out for on the plans.
3. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.

    a. Provide nonconductive optical fiber general purpose cable (OFN or OFNG), nonconductive optical fiber plenum cable (OFNP), and nonconductive optical fiber riser cable (OFNR) rated cable in accordance with NFPA 70 and UL 910.
    b. Type OFNP or OFNR may be substituted for type OFN or OFNG and type OFNP may be substituted for type OFNR in accordance with NFPA 70.

4. Fiber media shall, at minimum, meet the following performance standards:

    a. ANSI/TIA 568-C.1
    b. ANSI/TIA 568-C.3

5. Fiber media shall, at minimum, meet one of the following construction standards:

    a. ANSI/ICEA S-87-640-2011 Fiber Optic Outside Plant Communications Cable
    b. ANSI/ICEA S-83-596-2011 Indoor Optical Fiber Cables

6. Construction

a. Indoor: All dielectric, unless otherwise noted.
b. Outdoor: All dielectric, unless otherwise noted.

7. The cable cordage jacket, fiber, unit, and group color shall be in accordance with EIA TIA/EIA-598-B.

   a. Colors shall be across specified storage/installation temperature range.
   b. Means of providing conforming colors shall not degrade performance of cable.

8. Jacket:

   a. Free of splits, holes or blisters.
   b. Marked and listed in conformance with California Electric Code 770
   c. Conform with

      1) UL 1666 and
      2) NFPA 70

   d. Heavy duty construction, Fiberglass Epoxy Rod/Kevlar strength member(s).
   e. Each fiber to be 100% attenuation tested by the Manufacturer prior to shipping.
   f. Cable shall be imprinted with fiber count, fiber type and aggregate length at regular intervals not to exceed 40 inches. Hybrid fiber optic cable marking shall comply with TIA/EIA-598-B.

9. Performance:

   a. All fibers in the cable must be usable and meet required specifications.
   b. Each optical fiber shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.
   c. Temperature Sensitivity:

      1) Storage: -40C degrees to +70C degrees.
      2) Installation: -30C degrees to +70C degrees.

   d. Variance:

      1) Single Mode:

         a) Average change, not more than 0.05 dB/km at 1550 -40C degrees to +70C degrees.
         b) Maximum change not more than 0.15 dB/km at 1550 nm.

B. Fiber Strands, Singlemode - General

1. Meeting

   a. ISO/IEC 24702 OS2
   b. TIA 568C.3 and EIA TIA/EIA-492CAAA, single-mode, 8/125-um diameter, 0.10 numerical aperture.

2. Construction:

   a. Each optical fiber shall consist of a germania-doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.
   b. Each optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100 kpsi (0.7 GN/m2).
   c. The fiber shall be coated with a dual layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.
   d. The attenuation specification shall be a maximum value for each cabled fiber at 23 ± 5 °C on the original shipping reel.
   e. Single-mode (Dispersion Un-shifted): The single-mode fiber shall meet EIA/TIA-492CAAB, "Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak," and ITU recommendation G.652 (Categories A, B, C & D), “Characteristics of a single-mode optical fiber cable.”
   f. Meets or exceeds ISO/IEC 11801 OS2
   g. Geometry

      1) Cladding Diameter (µm): 125.0 ± 0.7
      2) Core-to-Cladding Concentricity (µm): = 0.5
      3) Cladding Non-Circularity: = 0.7 %
      4) Mode Field Diameter (µm)

         (a) 1310 nm: 9.2 ± 0.4
         (b) 1550 nm: 10.4 ± 0.5

      5) Coating Diameter (µm): 245 ± 5
      6) Colored Fiber Nominal Diameter (µm): 249 - 259
      7) Fiber Curl radius of curvature (m): > 4.0 m

   h. Optical

      1) Cabled Fiber
         Attenuation (dB/km) (a)
         1310 nm: = 0.4

(b) 1550 nm: = 0.3

2) Point discontinuity (dB) (a) 1310 nm: = 0.05 (b) 1550 nm: = 0.05

3) Macrobend Attenuation

Turns	Mandrel OD (mm)	dB
1	32 ± 2	≤ 0.05 at 1550 nm
100	32 ± 2	≤ 0.05 at 1310 nm
100	50 ± 2	≤ 0.05 at 1550 nm
100	60 ± 2	≤ 0.05 at 1625 nm

4) Cable Cutoff Wavelength (? ccf) (nm): < 1260
5) Zero Dispersion Wavelength (?o) (nm): 1302 = ?o = 1324
6) Zero Dispersion Slope (So) (ps/(nm²•km)): = 0.092
7) Total Dispersion (ps/(nm•km))

   a) 1285-1330 nm: = 3.8
   b) 1550 nm: = 17.5
   c) 1625 nm: = 21.6

8) Cabled Polarization Mode Dispersion (psvkm): = 0.2
9) IEEE 802.3 GbE - 1300 nm Laser Distance (m): up to 5000
10) Water Peak Attenuation: 1383 ± 3 nm (dB/km): = 0.4

i. Manufacturer:

1) Corning 28e
2) OFS
3) or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All system cabling and terminations be installed in accordance with

the manufacturer's instructions and as shown.

B. All necessary interconnections, services, and adjustments required for a complete and operable system shall be provided. All installation work must be done in accordance with the safety requirements set forth in the general requirements of ANSI C2 and NFPA 70.

C. Coordinate insulation displacement (quick connect) terminal devices with wire size and type. Comply with manufacturer's recommendations. Make connections with automatic impact type tooling set to recommended force.

D. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross, or where hinged panels are to be interconnected.

E. The Contractor shall be responsible for all damage to the cable during placement.

   1. Cabling shall be maintained free of splits, holes or blisters.
   2. Cabling shall not be painted or exposed to construction solvents or other caustic chemicals unless rated and warrantied for such exposure by its manufacturer.

F. Correct unacceptable wiring conditions including but not limited to:

   1. Deformed, brittle or cracked insulation.
   2. Torn or worn cable jacket.
   3. Excessively scored cable jackets.
   4. Insulation shrunken or stripped further than 1/8" away from the actual point of connection within a connector, or on a punch block.
   5. Ungrommeted, unbushed, or uninsulated wire or cable entries.
   6. Deformation or improper radius of wire or cable.

3.2 SPLICING

A. All interior wire and outside plant/exterior cable shall be continuous and splice-free for the entire length of run between designated connections or terminations.

   1. At designated splices, maintain conductor color code across all splices.

      a. All shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, panels or equipment enclosures.

b. Within buildings, make splices only in designated terminal cabinets and/or on designated equipment backboards.

B. Backbone Copper Cabling

1. At interior: Provide splice free cabling between Telecommunications Rooms, and from Telecommunications rooms to all locations in the same building indicated for backbone copper cabling media.
2. At outside plant: Do not splice at exterior, unless different splicing is indicated on Plans or is unavoidable due to either cable length exceeding the maximum commercially available in the indicated pair count, or due to on-site pulling conditions. In either condition, provide documentation of the condition to the Owner's Representative for review prior to proceeding. If the Owner's Representative concurs that the conditions warrant the splice:

   a. Splice only within manholes, not vaults or pullboxes.
   b. Provide specified multipair splices assembly.
   c. Protect the splice in an encapsulated splice case fastened to a pair of cable rack arms.
   d. Document the installed splice case on the record drawings.
   e. Encapsulated Closures

      1) Adhere to all manufacturer installation guidelines.
      2) Support closure at both ends via racks and steps, so that no unnecessary stress or weight is applied to the splice case or associated conductors.

      3) End Caps and Closure Extension Sleeves

         a) Adhere to all manufacturer installation guidelines.

      4) Encapsulants

         a) Adhere to all manufacturer installation guidelines.

      5) Splicing Tapes

         a) Adhere to all manufacturer usage guidelines.

      6) Gel Stripper

         a) Adhere to all manufacturer usage guidelines.

C. Fiber Optic Cabling

1. At interior: Provide splice free cabling between Telecommunications

rooms, and from Telecommunications rooms to all locations in the same building indicated for backbone fiber cabling media.

2. At outside plant: Do not splice at exterior unless splicing is indicated on Plans or is unavoidable due to either cable length exceeding the maximum commercially available in the indicated strand count, or due to on-site pulling conditions. In either condition, provide documentation of the condition to the Owner's Representative for review prior to proceeding. If the Owner's Representative concurs that the conditions warrant the splice:
3. Splice only within manholes.

    a. Provide fusion splices.
    b. Protect the splice in a fiberoptic splice case fastened to a pair of cable rack arms.
    c. Document the installed splice case on the record drawings.

4. Splicing, where required due to field pulling conditions and/or cable length limits, shall be provided at no additional cost to the Owner.

D. Ensure that all splice closures are properly sealed for protection of the cable and splices.

3.3 PULLING IN

A. Verify that all raceway has been de-burred and properly joined, coupled, and terminated prior to installation of cables. Verify that all raceway is clear of foreign matter and substances prior to installation of wire or cable.

B. Inspect all conduit bends to verify proper radius. Comply with Code for minimum permissible radius and maximum permissible deformation.

C. Apply a chemically inert lubricant to all wire and cable prior to pulling in conduit. Do not subject wire and cable to tension greater than that recommended by the manufacturer. Use multi-spool rollers where cable is pulled in place around bends. Do not pull reverse bends.

D. Provide a box loop for all wire and cable routed through junction boxes or distribution panels. Cable loops and bends shall not be bent at a radius greater than that recommended by the manufacturer.

E. Pull Rope/Tape

1. For OSP installations, pull new pulling ‘mule’ tape through all conduits while placing new backbone cable. Leave a pulling ‘mule’ tape in the utilized conduits for future use.
2. For ISP installations, pull new pull rope through all conduits while

placing new backbone cable. Leave a pull rope in the utilized conduits for future use.

F. Do not leave cable slack on cable runway

G. Firestop all sleeves, station cable conduit and ISP backbone conduit openings through rated partitions after the cable installation is complete.

3.4 SUPPORT

A. Support: Provide support for all cabling. Conform to the restrictions of the California Electric Code and Section 27 05 29. Secure all wire and cable run vertically for continuous distances greater than thirty (30) feet. Secure robust non-coaxial cables with screw-flange nylon cable ties or similar devices appropriate to weight of cable. For all other cables, provide symmetrical conforming nonmetallic bushings or woven cable grips appropriate to weight of cable.

B. Separation from sources of Electromagnetic Interference: Conform with the requirements of ANSI/TIA-569-C, 9.3 Pathway Separation from EMI sources.

3.5 FIBER OPTIC CABLE TESTING

A. ADMINISTRATION

1. Administration of the documentation shall include test results of each fiber link.
2. The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.
3. The test result records saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.

B. GENERAL

1. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
2. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

C. OPTICAL FIBER CABLE TESTING

1. Field-test instruments shall have the latest software and firmware installed.
2. Link test results from the OLTS shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
3. Testing shall be performed on each cabling segment (connector to connector).
4. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. .

    a. Optical loss testing

        1) Backbone link

            a) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.
            b) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
            c) Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
            d) Each fiber link shall be tested in both directions.

    b. Polarity Testing

        1) Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA 568 C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

5. Test Results Documentation

    a. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”. The file format, CSV (comma separated value), does not provide adequate protection of these

records and shall not be used. PDFs shall not be used

b. The test results documentation shall be available for inspection by the the Owner's representative during the installation period and shall be passed to the Owner's representative within 5 working days of completion of tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as built information.
c. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD-ROM prior to Owner acceptance of the building. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.
d. Circuit IDs reported by the test instrument should match the specified label ID (see Error! Reference source not found. of this Section).
e. The detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information:

    1) The identification of the Owner site as specified by the Owner's Representative.
    2) The name of the test limit selected to execute the stored test results
    3) The name of the personnel performing the test
    4) The date and time the test results were saved in the memory of the tester
    5) The manufacturer, model and serial number of the field-test instrument
    6) The version of the test software and the version of the test limit database held within the test instrument
    7) The fiber identification number
    8) The length for each optical fiber

        a) The index of refraction used for length calculation when using a length capable OLTS

    9) Test results to include OLTS attenuation link measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
    10) The overall Pass/Fail evaluation of the link-under-test for OLTS measurements.

3.6 CATEGORY RATED STATION PROOF OF PERFORMANCE DEMONSTRATION

A. Comply with the requirements of Part 1 of this Section and the following:

1. After submittal of test result documentation and the associated as-built drawings, the Owner's Representative shall randomly pick five percent (5%) of the submitted cable plant installation for re-test.
2. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.

3.7 LABELING

A. Reference Section 27 05 53 - Identification For Communications Systems, the plans and the specifications.

B. Comply with labeling instructions to include, but not be limited to, the following:

1. Label technology to be utilized;
2. Label content;
3. Label placement

3.8 REMOVAL OF ABANDONED CABLING

A. The California Electrical Code (CEC) requires all unused telecommunications cable intended for future use to be terminated in a patch panel or cross-connect and labeled for such use. Any other unused cable is considered abandoned including cable abandoned due to installation of new cabling under the work of this Project.

B. Abandoned cable must be removed and disposed of, per CEC 770.53(A) & 770.53(B) (fiber) and 800.52(B), 800.53(A) & 800.53(B) (copper). Similar requirements are elsewhere in the CEC for other types of cable.

C. Refer to Division1 regarding means and methods to be employed in the disposal of construction waste materials including material subject to recycling such as abandoned copper cabling.

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ISSUED FOR BID 3/3/2026

SECTION 27 11 16

COMMUNICATIONS CABINETS, RACKS, FRAMES AND ENCLOSURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Communications racks and cabinets.

1.2 RELATED WORK BY OTHERS

A. By the Owner's Network Integrator

1. Data switching equipment
2. Rack Mounted UPS and Extender Battery Packs
3. Rack mounted power strips/PDU's

1.3 RELATED WORK IN OTHER SECTIONS

A. Division 26

1. Power at equipment racks mounted to cable tray above floor mounted racks and internal to wall mounted racks unless otherwise noted.

B. Section 27 0526 - Grounding and Bonding for Communications Systems

1. Bonds racks and cabinets.

C. Section 27 0533 - Conduits and Backboxes for Communications Systems

1. Signal systems raceways at communications rooms

D. Section 27 0536 - Cable Trays for Communications Systems

1. Signal systems cable tray at communications rooms

E. Section 27 1300 - Communications Inside Backbone Cabling

1. Inside Backbone Terminations at communications rooms.

F. Section 27 1500 Communications Horizontal Cabling

1. Rack mounted horizontal patch panels.

1.4 REFERENCES

A. American National Standards Institute (ANSI)

1. EIA-310-D (1992) Cabinets, Racks, Panels, and Associated Equipment (ANSI/EIA/310-D)
2. ANSI-J-STD-607-B (2011) Generic Telecommunications Bonding and Ground (Earthing) for Customer Premises

1.5 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications.

1.6 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1 and Section 27 1000 - Structured Cabling, Basic Materials and Methods.

1.7 SEQUENCING

A. Not Used.

PART 2 - PRODUCTS

2.1 GENERAL

A. KEYS

1. Key all boxes, cabinets, enclosures, panels, controls, doors and related provided for similar usage within a system identically.

2.2 EQUIPMENT ENCLOSURE SYSTEMS

A. General:

1. Provide enclosure systems including, but not limited to enclosures,

cabinets, cases and related panels and accessories as specified herein. Provide size and quantity as shown on drawings or scheduled.

2. Provide color as shown on drawings. If no color is shown on drawings, submit manufacturer's standard color chips for selection.
3. Provide enclosure systems conforming to the IBC, latest edition, for bracing design.
4. Equipment Enclosures: Each rack provided with frame angles tapped 10-32, ANSI/EIA 310-D Universal Spaced.

B. Rack, Wall Mount, Three Section, Horizontal Pivoting

1. Drawing Reference: R12X, where X is indicated panel opening size.
2. Construction:

    a. Wall mounted, three part sectional, with:

        1) Steel, fixed mount wall terminal section
        2) Steel, center swing out section
        3) Vented steel locking front door.

    b. Fully depth-adjustable front and rear mounting rails.
    c. Combined depth of swing-away center section and fixed rear section to be not less than as scheduled below.
    d. Center section swing is reversible, and can be both keylocked and padlocked

3. Approvals:

    a. UL Standards Tested: UL2416
    b. ASCE: 7-10

4. UL Load Capacity: 300 pounds minimum.
5. Seismic Certified: 140 pounds minimum, dynamic load.
6. Meets 2010 CBC; 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) “D” with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5
7. Front door 64% Open Minimum, Center Section vented to permit air intake from front and discharge to sides.
8. Drawing Reference Schedule:

R12 Designator	Nom. Outside Width (in.)	Nom. Outside Depth (in.)	Nom. Outside Height (in.)	Panel Opening Size in Rack Units (1 R.U. = 1.75")
R12A	23.4	17.3	24.5	10
R12B	23.4	22.3	24.5	10
R12C	23.4	17.3	28	12
R12D	23.4	22.3	28	12
R12E	23.4	26.3	28	12
R12F	23.4	32.3	28	12
R12G	23.4	17.3	35	16
R12H	23.4	22.3	35	16
R12I	23.4	17.3	38.5	18
R12J	23.4	22.3	38.5	18
R12K	23.4	26.3	38.5	18
R12L	23.4	32.3	38.5	18
R12M	23.4	17.3	43.75	21
R12N	23.4	22.3	43.75	21
R12O	23.4	17.3	49	24
R12P	23.4	22.3	49	24
R12Q	23.4	26.3	49	24
R12R	23.4	32.3	49	24
R12S	23.4	17.3	68.25	35
R12T	23.4	22.3	68.25	35
R12U	23.4	26.3	68.25	35

9. Manufacturers

    a. Middle Atlantic Products DWR Series LVFD Front Door, DWR-RR rear rail kit and DWRSR-ZL Latch. (Design Basis).
    b. Hubbell Wall Mount Cabinets
    c. B-Line
    d. CPI
    e. Hoffman
    f. Damac.
    g. Encore.
    h. or equal.

C. Rack, Floor Mount, Three Section, Horizontal Pivoting

1. Construction:

    a. Floor mounted, wall braced three part sectional, with:

1) Steel, fixed mount floor/wall terminal section
2) Steel, center swing out section
3) Vented steel locking front door.

b. Fully depth-adjustable front and rear mounting rails.
c. Combined depth of swing-away center section and fixed rear section to be not less than as scheduled below.
d. Center section swing is reversible, and can be both keylocked and padlocked

2. Approvals:

a. UL Standards Tested: UL2416
b. ASCE: 7-10

3. UL Load Capacity: 500 pounds minimum.
4. Seismic Certified: 336 pounds minimum, dynamic load.
5. Meets 2010 CBC; 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) “D” with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5
6. Front door 64% Open Minimum, Center Section vented to permit air intake from front and discharge to sides.
7. Drawing Reference Schedule:

R13 Designator	Nom. Outside Width (in.)	Nom. Outside Depth (in.)	Nom. Outside Height (in.)	Panel Opening Size in Rack Units (1 R.U. = 1.75")
R13E	23.6	32.3	90.75	40

8. Manufacturers

a. Middle Atlantic Products SR-40-32 , LVFD-40 Door, DWR-RR40 rear rails and DWRSR-ZL latch (Design Basis).
b. Hubbell
c. B-Line
d. CPI

e. Hoffman
f. Damac.
g. Encore.
h. or equal.

D. Equipment Rack, Seismic Front, Rear and Side Access, with Vertical Wire Management.

1. Drawing References: R28
2. Minimum Features, Function & Construction:

a. Manufacturer tested Zone 4 assembly, rated for at least 900 pounds of uniformly distributed load, upper floor load, of essential equipment per California Building Code/Uniform Building Code.
b. Fully welded construction provides:

1) Static load capacity: 10,000 lbs.
2) UL Listed load capacity: 2,500lbs.
3) Seismic Certified load capacity: 755 lbs.

c. Seismic certified to the following codes and standards: 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity - Zone 4 or Seismic Design Category (SDC) "D". Intended for use in Mission Critical and/or
High-Importance Installations in locations with the highest level of seismicity and top floor or rooftop installations including those within UBC and CBC Essential facilities or IBC, ASCE 7, and NFPA 5000 Seismic Use Group III facilities. For all codes, the Importance factor (Ip) is 1.5.
d. Vertical Height (Min): 44 RU
e. Outside depth: 40” minimum - 42 inches maximum.
f. Width: Not to exceed 30 inches
g. Lockable, 70% open area perforated mesh full height front and rear doors:

1) Front door with wire mesh insert covers rack contents - swing shall be field adjustable to swing from either right or left.
2) Rear doors to be a pair of half width doors, each with a wire mesh to cover rack contents.
3) Wire mesh, vertical center split rear door pair.

h. Front and rear 19" mounting rail pairs DIN square holes on EIA

spacing standard are fully adjustable in depth of setback from front to rear.

i. Vertical cable management rings, continuous, full height cable management system shall be installed:

   1) fully inside of the rack enclosure, with 2" minimum clearance behind front and rear rack frame.
   2) fully outside (to left of left rail and to right of right rail, and out of conflict with EIA Rails. Cable management system mounting shall not occupy rail screw openings.
   3) Front managers shall be accessible from front in fully loaded equipment rack.
   4) Rear managers shall be accessible from rear in fully loaded equipment rack

j. 60% or greater perforated top panel occupying at least 50% of the stop surface of the cabinet allows passive heat radiation from rack interior to the exterior.

k. Cutouts and removable covers in cabinet top accommodates vertical transition of cabling from tray above into rack interior.

l. Gangable. Racks have been designed such that they are suitable for installation either as a single, standalone unit, or in a row of identical racks (gangable).

   1) Single rack installation. Provide side panels at both sides.
   2) Multirack installation in a row. Bolt racks together using means provided by manufacturer. Omit side panels except at ends of row of racks - provide at ends of rows of racks.

3. Manufacturers. Provide manufacturer's accessories or 3rd party accessories as specified elsewhere in this Section for other specified elements. Coordinate selected shelves, fans and similar with rack submitted for finish and mounting means.:

   a. Middle Atlantic DRK19-44-42PRO with DLVFD-44 front door, DCLVRD-44 rear doors, MRK-Z4 Base angles, 2 pair DRK-44DUCT (front and rear, 4 total vertical ducts), MW-LVT 64% open area top insert. Keylocked side panels SPN-44-36 at ends of rows.
   b. APC Infrastructure
   c. Hoffmann
   d. Liebert/Knurr
   e. Tripplite
   f. Wrightline Paramount, Vantage or Vantage 2.
   g. or equal.

E. Equipment Enclosure, NEMA 3R

1. Drawing References: R40
2. Minimum Features, Function & Construction

a. General:

1) Cabinet to be designed by the manufacturer to serve as a rack mount enclosure intended to house electronic controls, terminals and instruments, and to provide protection from rain, sleet, snow, dripping water and corrosion.
2) The cabinet and door(s) shall be constructed from 5052-H32 sheet aluminum alloy which has a thickness of 0.125 inch. External welds shall be made by using the Heliarc welding method; internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blow holes and other irregularities.
3) All inside and outside edges of the cabinet shall be free of burrs.
4) The cabinet shall be designed with a crowned top or equivalent method to prevent the accumulation of water on its top surface.
5) The door opening(s) shall be double flanged on all four (4) sides which increases strength around openings and keeps dirt and liquids from entering the enclosure when door is opened.
6) Door restraint(s) shall be provided to prevent door movement in windy conditions.
7) Enclosure shall incorporate manufacturer's 800 BTU minimum air conditioning assembly providing cooling of enclosure interior without air exchange between exterior and interior of enclosure.

b. Nominal Size:

1) 67" High x 24" wide x 38" deep

c. Door/Hardware

1) The cabinet front and rear doors will be a minimum of 80% of the front and rear surface area and shall be hinged on the same side when facing the cabinet.

a) The doors shall be furnished with a gasket that satisfies the physical properties as found in UL508 table 21.1 and shall from a weathertight seal between the cabinet and door.

b) The closed doors will be flush with the side(s) of the enclosure.

2) The hinges shall be bolted to the cabinet and door utilizing 1/4-20 stainless steel carriage bolts and nylock nuts.

a) The hinges will be made of 0.075 inch stainless steel with a 0.250 inch diameter stainless steel hinge pin.
b) The hinge pin shall be capped top and bottom by weld to render it tamperproof. All bolt holes shall be gasketed.

3) The latching mechanism shall be a three-point draw roller type.

a) Pushrods will be turned edgewise at the outward supports and shall be 0.250 inch by 0.750 inch aluminum, minimum.
b) Rollers shall have a minimum diameter of 0.875 inch and will be made of nylon. The center catch shall be fabricated from 0.187 aluminum, minimum.

4) An operating handle shall be furnished.

a) The handle will be stainless steel with a 3/4 inch diameter shank.
b) The latching handles shall have a provision for to accept a Owner furnished padlocking in the closed position.
c) A light/alarm switch bracket shall be provided.

d. Equipment Mounting

1) The enclosures shall be equipped with mounting brackets that accommodate the mounting of a 19" rack frame assembly.

e. Cabinet Finish

1) Unless otherwise specified, the outside surface of the cabinet shall have a smooth, uniform, natural aluminum finish.

a) If painted, the following steps shall be taken as a minimum requirement:

(1) The cabinet door and any other parts to be painted

will be treated with an iron phosphate coating conversion technique.

(2) After phosphatizing, the parts shall be baked to eliminate any moisture in seams.

(3) The finishing coat of a polyester powder will be baked at 400-450 degrees F for ten (10) minutes.

(4) The finish shall be commercially smooth, substantially free of flow lines, paint washout, streaks, blisters and other defects that would impair serviceability or detract from general appearance.

f. Internal Rack Frame

1) 30 EIA 310-D Rack Units (RU) minimum.
2) 29” rack frame depth between front and rear EIA mounting rails minimum

g. Cabinet Mounting

1) Enclosures intended for pedestal mounting shall be provided with a reinforced base plate with gasketed mounting holes.

h. Insulation

1) Provide insulation sufficient to reflect out of the cabinet 95% of the incoming radiant solar heat.

i. Sushade

1) Provide with manufacturer’s custom aluminum sunshade kit selected and configured to reduce solar exposure during peak months.

3. Approvals

a. Nationally recognized testing laboratory: UL, ETL or equal.
b. NEMA 3R Construction

4. Manufacturers:

a. APX Enclosures, Inc. NEMA 3R Rack Mount Enclosure Model RM672438 with manufacturer’s Air Conditioning system and Climate Control insulation treatment and with custom manufacturer Sunshade and RM672438 rack frame.

b. Hoffmann
c. Electrorack
d. DDB Unlimited
e. Or equal.

2.3 RACK PANELS AND ACCESSORIES

A. Rack Mounting Screws:

1. Screws 10-32; length as required for at least 1/4" excess when fully seated; oval head with black plastic non marring cup washer or equivalent ornamental head; nickel, cadmium or black plated; Phillips, Allen Hex, Square-Tip or Torx drive. Slotted screws are not acceptable.

B. Blank Panels:

1. Construction

a. 16 gauge minimum cold rolled steel
b. Powder coat finish to match rack color, unless otherwise noted

2. Manufacturers

a. Middle Atlantic Products EB or FEB Series.
b. Ortronics Filler Panels.
c. CPI Snap-In Filler Panel
d. Atlas Sound S19 Series.
e. BGW Systems Inc. Flanged Steel Blank Panels
f. Dukane
g. Elkay
h. Lowell Series L3
i. Zero ZP112000 Series.
j. Hubbell
k. or equal.

C. Vent Panels:

1. Construction

a. 20 gauge minimum cold rolled steel
b. 1/8" minimum holes, at least 70% open total panel cross-section.
c. Powder coat finish to match rack color, unless otherwise noted

2. Manufacturers

a. Atlas Sound SVP Series.
b. BGW Systems Inc. Perforated Vent Panels
c. House of Metal Enclosures (HOME) Series PRP.
d. Lowell Series L5
e. Middle Atlantic Products VT Series.
f. Zero.
g. or equal.

D. Vertical Lacer Strips

1. 44RU high vertical steel strips with points for attachment of velco cable ties at at least 6” o.c.
2. Manufacturer:

a. Middle Atlantic LACE-44LP
b. APW
c. or equal.

E. Horizontal Lacer Bars

1. EIA 19” Width steel strips or bars suitable to provide support to large cable dressed horizontally through racks
2. Size to suit load and mounting width.
3. Manufacturer:

a. Middle Atlantic LBP-1R4, LBP-1.5 and LBP-1S.
b. APW
c. or equal.

F. Seismic Hold-down Equipment Straps

1. Drawing Reference: None - Provide as required to secure equipment that cannot be screw fastened to mounting shelves.
2. Manufacturers:

a. BGW Systems
b. Everest Electronic Equipment Lock Down Kit
c. Ergotron
d. Chatsworth Products
e. Middle Atlantic Products
f. Q-Safety, Inc.
g. or equal.

PART 3 - EXECUTION

3.1 MOUNTING

A. Unless otherwise noted, all floor supported equipment racks shall be bolted to the structure in accordance with the requirements of the CBC and the Walnut Valley Water District approved mounting details.

B. Rows of identical racks shall be bolted together, in addition to being bolted to the floor, and bonded to form a single electrical ground plane.

C. Wall mounted equipment racks and cabinets shall similarly be bolted to structural members in accordance with the requirements of the CBC and the Walnut Valley Water District approved mounting details.

3.2 EQUIPMENT ENCLOSURE (RACK) AND EQUIPMENT BACKBOARD FABRICATION

A. Combustible material, other than incidental trim of indicated equipment, is prohibited within equipment racks.

B. Provide permanent labels for all equipment and devices.

C. Access shall not require demounting or de-energizing of equipment. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

D. Recess rails prior to assembly to permit free closure of doors over installed equipment and wire managers.

E. Provide a permanent label on the front of each equipment rack including the rack designation, and the circuit breaker number and associated electrical distribution panel designation servicing same.

F. Where wiring of mixed types are called for on the plans, maintain separation of wiring classifications as specified in the individual sections of Division 27.

G. Provide vertical wire management of cabling within the rack independent of the adjustable EIA mounting rails. Vertical wiring management provided by the contractor within the rack shall not prevent such rails from being moved as required by the Owner.

H. Dress and support cabling at a minimum of 24 inch on center. Dress all

cabling in swing racks to prevent motion of cabling relative to patch panel during operation of the swing rack.

I. Access shall not require demounting or de-energizing of equipment or cabling. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

J. Fasten removable covers containing any wired component with a continuous hinge along one side, with associated wiring secured and dressed to provide an adequate service loop. Provide an appropriate stop locks to hold all hinged panels and drawers in a serviceable position.

K. Provide permanent labels for all equipment and devices. Where possible, fasten such labels to the rack frame or to blank or vent panels which will remain in place when active equipment is removed for possible service.

L. Coordinate the design and execution of wire harnessing of multi-bay audio and video rack ensembles with conditions of delivery to installation locations at Project Site, and with the requirement herein for test of the completely wired system in the shop prior to delivery to the Project Site. Organize the wiring harnesses such that they will fold within one shippable unit without risk of damage, or provide polarized multipin connectors and related interconnect systems as specified elsewhere herein.

3.3 SIGNAL GROUNDING & BONDING PROCEDURES

A. Comply with National Electrical Code. Bond equipment racks to ground in accordance with the California Electric Code, ANSI/ TIA 607-B and Section 27 05 26

B. Equipment enclosures shall not be permitted to touch each other unless bolted together and electrically bonded.

****

SECTION 27 11 19

COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section defines material standards for:

1. Copper Termination Assemblies, including

   a. Rack and cabinet mounted copper patch panels
   b. Backboard, rack and cabinet mounted terminal blocks

2. Fiber Termination Assemblies, including:

   a. Fiber connectors
   b. Fiber Consolidation Panels
   c. Rack and cabinet mounted fiber patch panels
   d. Backboard mounted fiber terminal boxes

3. Hybrid Copper/Fiber Termination Assemblies

1.2 RELATED WORK UNDER OTHER SECTIONS

A. Section 27 0500 - Common Work Results for Communications

B. Section 27 0526 - Grounding and Bonding for Communications Systems

C. Section 27 1000 - Structured Cabling, Basic Materials and Methods

D. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures

E. Section 27 1123 - Communications Cable Management

F. Section 27 1300 - Communications Interior Backbone Cabling

G. Section 27 1500 - Communications Horizontal Cabling

1.3 REFERENCES:

A. ELECTRONIC INDUSTRIES ALLIANCE (EIA)

1. EIA-310-D (1992) Cabinets, Racks, Panels, and Associated Equipment (ANSI/EIA/310-D)

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 05 00 - Common Work Results for Communications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1 and Section 27 10 00 - Structured Cabling, Basic Materials and Methods.

1.6 SEQUENCING

A. Not Used.

PART 2 - PRODUCTS

2.1 COPPER CABLE TERMINATION DEVICES AND RELATED

A. Category 5e Terminal Block.

1. Drawing reference(s):

   a. 110TB6 6 pair
   b. 110TB25 25 pair
   c. 110TB50 50 pair
   d. 110TB100 100 pair
   e. 110TB300 300 pair
   f. 110TB600 600 pair

2. General: Insulation displacements connector blocks consisting of oxygen free mechanical fastening system arranged in a flame-retardant molded plastic fastened to a mounting bracket.

3. Features/Functions

   a. “110 type” punch down type.
   b. Cable routing space behind the blocks.

4. Conforms with REA PE-87.
5. Performance:

a. Complies with Commscope/Systimax 110 Premises Distribution System Specifications
b. Electrical (measured at 50 MHz).
c. Resistance: Not more than .4 ohms/termination
d. Inductance: Not more than 13 nH/termination
e. Capacitance:

1) Not more than .9 pF/termination, same pair.
2) Not more than .7 pF/termination, next pair.

6. Construction/Implementation

a. Provide complete with standoff mounting brackets
b. Provide trough at the bottom of each column of blocks.
c. Unless otherwise noted, provide WMP between each column of blocks, and at the outside edges of each group of block columns.

7. Manufacturer:

a. Siemon S110 or S110M Modular Tower System

1) S110M42-300FT300 Pair
2) S110M42-400FT400 Pair
3) S110M42-500FT500 Pair
4) S188WDTrough

b. Ortronics.

1) 110-PB2-300FT300 Pair
2) 110-PB2-900FT900 Pair

c. Hubbell Wall Mount Kits, 110
d. AMP CrossConnect Distribution Frame Kit 56985* Series
e. Leviton
f. Commscope/Systimax
g. Commscope/Uniprise

h. Wiremold.
i. Panduit.
j. or equal.

B. Rack Mount Category 6 Terminal Block

1. Drawing reference

a. 110TB050RM 50 pair
b. 110TB100RM 100 pair
c. 110TB200RM 200 pair
d. 110TB300RM 300 pair

2. Construction

a. Category 6 110 Block mounted on a 19" rack panel.
b. Otherwise as for 110TB

3. Manufacturer

a. Panduit P110B100R2Y
b. Siemon
c. Ortronics
d. Hubbell
e. Leviton
f. or equal

C. Data Patch Panels, Keystone, Rack Mounted

1. Drawing Reference:*** C6*PP, where *** refers to port count.
2. Functions/Features:

a. 19" EIA rack mountable.
b. At least 24 ports per EIA rack unit (1.75").
c. Industry **standard** keystone openings in steel plate
d. arranged in rows on steel panel,
e. jacks on front,
f. terminations on rear.
g. Port identifier label space on front.
h. Fill each opening with Category 6 and Category 6A keystone jacks to match cable count on plans and schedules. Coordinate jack selection with patch panel construction to ensure that jack width behind the panel does not prevent fully loading panel.
i. Integral cable management bar at rear.

3. Manufacturer

a. Leviton QuickPort High Density Multimedia Patch Panels with Management Bar
b. Panduit Netkey
c. Hubbell Xcelerator Series Panels
d. Molex EZ Patch
e. ADC/Krone
f. Ortronics
g. or equal.

D. Category 3 Rack Mount Patch Panels with Pre-Wired RJ-21C (50 Pin) connector, 8P4C

1. Drawing reference:

   a. **PWC3PP, where ** designates port count.

2. Features/Functions/Construction:

   a. 19" EIA rack mount panel.
   b. Front face - RJ45

3. Rear Face - Two pre-wired RJ21C connector (50 Pin).
4. Printed Circuit board linking RJ45's to two RJ21C (Amphenol Connectors) to center 2 pairs (pins 3-6) on RJ45's.

5. Approvals

   a. ANSI/TIA-568-C.2 for Category 3 performance
   b. ANSI/TIA-1096A (formerly FCC Part 68)
   c. Nationally recognized test laboratory (NRTL) listed

6. At least 24 Jacks per rack unit (RU).

7. Manufacturers:

   a. Leviton 49014-J24
   b. Hubbell
   c. Amp
   d. Panduit
   e. or equal

2.2 FIBER CABLE TERMINATION DEVICES AND RELATED:

A. Fiber Optic Connectors and Related:

1. General

   a. Connectors to comply with:

      1) EIA/TIA 4750000-C
      2) EIA/TIA-604-3A

2. Fusion Splice System

a. Insertion Loss:

1) =0.03 dB - manufacturer's rating for typical splice - multimode
2) =0.06 dB - manufacturer's rating for typical splice - singlemode.

b. Manufacturer

1) Corning Cable Systems Model X77 Micro Fusion Splicer
2) AFL Telecommunications.
3) or equal.

3. Connectors:

a. LC with manufacturer installed fiber pigtails unless otherwise noted or scheduled. Contractor to fusion splice the supplied pigtail to the fiber backbone cabling installed under the work of this Project.
b. Connector performance per TIA- 568.C.3 and the following.

1) Insertion Loss:

a) Multimode:

(1) Less than or equal to 0.75 dB per mated pair

b) Singlemode, Ultra Polish

(1) Less than or equal to 0.75 dB per mated pair

c) Singlemode, Angle Polish

(1) Less than or equal to 0.30 dB per mated pair

2) Return Loss

a) Singlemode, Ultra Polish, greater than or equal to 55 dB
b) Singlemode, Angle Polish, greater than or equal to 65 dB

3) Manufacturer, Connector

a) Corning Cable Systems
b) AMP
c) Commscope/Systimax
d) Hubbell
e) Leviton
f) Ortronics
g) or equal.

B. Fiber Distribution Panels, Splice and Patch.

1. Drawing References:

   a. *** FPP, Fiber Patch Panel where *** refers to the minimum potential fiber port count accommodated in the specified assembly. Refer to the single lines for the quantity of strands to be terminated under the work of this Project.

2. Features/Functions/Performance:

   a. 19" EIA rack mount.
   b. Suitable for housing fiber optic mechanical splices in a neat and orderly fashion.
   c. Stores a minimum of one meter of cable without kinks or twists.
   d. Suitable for use with connectors with manufacturer supplied fiber pigtails as required herein above, fusion spliced to building and outside plant backbone cabling.
   e. Provides individual strain relief for each splice.
   f. Suitable for reentry, if required for future maintenance or modification, without damage to the cable or splices
   g. All required splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors shall be provided.
   h. Incorporates cable tie downs and routing rings.
   i. Quick-Release Hinges - Spring loaded quick release hinges enable easy removal of front and rear doors for complete access to fiber connections
   j. Enhanced Labeling - Label virtually any port configuration hinged labels. The labels hang on the front door for improved visibility. When the door is opened, labels flip down allowing ready viewing of the label and corresponding ports.
   k. Rotating Grommets - Rotating grommets facilitate loading and retention of jumpers and fiber while minimizing microbending stress when using the sliding tray.
   l. Complete Access - Management tray has a positive stop in both front and rear working positions providing complete access for moving, adding, changing, or cleaning of fiber connections
   m. Maximum Capacity - Enables a maximum amount of fibers to be patched or patched and spliced in a 2, 3, and 4 RMS enclosure without compromising the accessibility. This allows more efficient utilization of rack space.
   n. Top and bottom access holes located at the rear of the enclosure allow fibers to be routed between tandem enclosures without having to run fibers outside of the enclosure.
   o. Color coded front panel patch connector - color yellow at singlemode strands and color blue at multimode strands. Provide

manufacturer's blank cover inserts at unused openings.

p. High Density - FPP can terminate between 18 to 36 strands per rack unit. Higher density assemblies not acceptable unless otherwise indicated on the plans.

3. Manufacturer:

   a. Corning Cable Systems Pretium Connector Housing (PCH) with splice trays, strain relief and Closet Connector Housing (CCH) inserts as required.
   b. Leviton OptX
   c. Hubbell OptiChannel FCR Rack Mount Enclosures with FSP Adapter Panels as required.
   d. Panduit
   e. Ortronics
   f. Commscope/Systimax
   g. or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 27 13 00 - Communications Indoor Backbone Cabling for requirements for termination of Riser and Outside Plant Cabling within Communications Rooms

B. Refer to Section 27 10 00 - Structured Cabling, Basic Materials and Methods and Section 27 15 00 - Communications Horizontal Cabling.

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SECTION 27 11 23

COMMUNICATIONS CABLE MANAGEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Innerduct

1. Inside buildings
2. At outside plant

B. Cable Management at Communication Room Backboards

C. Cable Management and patch cords at rack mounted Patch Panels, including provision of cable management for cabling installed under the work of this Project at equipment racks

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 27 0533 - Conduits and Backboxes for Communications Systems

B. Section 27 0536 - Cable Trays for Communications Systems

C. Section 27 0539 - Surface Raceways for Communications Systems

D. Section 27 0553 - Identification for Communications Systems

E. Section 27 1000 - Structured Cabling, Basic Materials and Methods

F. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures

G. Section 27 1119 - Communications Termination Blocks and Patch Panels

H. Section 27 1300 - Communications Interior Backbone Cabling

I. Section 27 1500 - Communications Horizontal Cabling

1.3 REFERENCES

A. American Society For Testing and Materials (ASTM)

1. ASTM D2239-03 Standard Specification for Polyethylene (PE) Plastic

Pipe (SIDR-PR) Based on Controlled Inside Diameter

B. Underwriters Laboratories (UL)

1. UL 910 Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables used in Spaces Transporting Environmental Air (Nov. 1998)

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1 and Section 27 1000 - Structured Cabling, Basic Materials and Methods.

1.6 SEQUENCING

A. Not Used.

PART 2 - PRODUCTS

2.1 INNERDUCT

A. Innerduct, Single Chamber

1. Drawing and spec reference(s):

   a. ID*, Innerduct ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).
   b. IDP*, Innerduct, Plenum ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).

2. Construction:

   a. Selected product suitable for:

      1) underground installation in ductbank,
      2) plenum (IDP)
      3) exposed, in interior utility rooms where indicated.

   b. High density polyethylene.

c. Ribbed or similar exterior construction to resist crushing surface to promote fiber cable installation.
d. Provides an interior chamber with a capacity equal to a trade size conduit referenced above.

3. Approvals:

a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
b. IDP - UL Standard Test Method 2024 of UL 910.

4. Manufacturers, ID in underground ductbanks:

a. Carlon Optic-Gard/PE.
b. Arnco.
c. Vikimatic.
d. or equal.

5. Manufacturers, ID in interior, non-plenum applications:

a. Carlon Optic-Gard/PVC.
b. Arnco.
c. Vikimatic.
d. or equal.

6. Manufacturers, IDP:

a. Carlon Plenum-Gard.
b. Arnco.
c. Vikimatic.
d. or equal.

B. Innerduct, UV Rated

1. Drawing Reference: ID, UV Rated*, where"*" denotes cross sectional area of each chamber referenced to standard conduit trade size).
2. Approvals:

a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

3. Construction.

a. Listed for UV exposure.

4. Manufacturers:

a. Tamaqua Plus II Series Telecom Duct.

b. Allwire Black AllDuct.
c. or equal.

C. Woven Mesh Innerduct

1. Drawing Reference: MID, WMID
2. Features/Functions

a. Three inch wide woven mesh assembly contains at least three continuous pullable sleeves, each can accommodate a cable of at least 1” diameter.
b. Systems providing fewer than 3 integrally woven sleeves per WMID assembly not acceptable.
c. Includes color coded pull tape in each sleeve.
d. Pre-Lubricated for cable pulling
e. Non-Hydroscopic
f. 2500 Pound Tensile Strength
g. 480 degree melting point.
h. At least 5 years prior field use including at least 25 million feet of product in use.
i. Provide plenum rated assembly at plenum locations as defined by the National Electric Code.

3. Manufacturers:

a. Maxcell/TVC

1) 2” 2-cell
2) 3” 3-cell in three unique colors per duct.

b. or equal (No known equal with identical 3 sleeves woven into a single assembly nor equal industry usage).

2.2 PATCH PANEL CABLE MANAGEMENT

A. Patch Panel Wire Management, Rack Mounted, Double Sided, Snap Cover.

1. Drawing References:

a. 1 RU Version: RMWM1C
b. 2 RU Version: RMWM2C

2. Construction

a. EIA 310-D 19" Rack Mount.
b. Continuous flexible system of T shaped fingers and slots along top and panel, deburred to avoid snagging patch cord jacket. Fingers

meet the requirements of UL 94V-0 flammability rating.

c. Wire management is provide to both front and rear of managers.
d. Contoured front door with snap-hinges swings 180 degrees up or down and stays in the open position while cabling.
e. Covers and panel have a black powder-coat textured finish,

1) reducing fingerprints and smudges

3. Capacity

a. 1 RU - accommodates at least 20 Cat 6 patch cords.
b. 2 RU - accommodates at least 53 Cat 6 patch cords.

4. Manufacturers - 1 RU

a. Chatsworth 30529-719
b. B-Line
c. Panduit
d. Siemon
e. Ortronics
f. or equal.

5. Manufacturers - 2 RU

a. Chatsworth 30530-719
b. B-Line
c. Panduit
d. Siemon
e. Ortronics
f. or equal.

2.3 BACKBOARD CABLE MANAGEMENT

A. Fiber Management Ring, Preformed Loop

1. Drawing Reference: FMR
2. Construction:

a. 24 inch diameter steel ring stores fiber slack using Velco fasteners at regular intervals around ring.
b. Screw fastens to backboard at BDF or IDF.

3. Manufacturer

a. Leviton 48900-OFR
b. Panduit

c. or equal.

B. Wire Management Rings, Wall/Ceiling Mounted:

1. Drawing References/Functions Features:

a. WMRB - Bridle Ring Type, Threaded Lag Screw
b. WMRC - Closed Ring, U shaped assembly with two screw holes at ends,
c. WMRO - Open, Re-enterable Split Ring permitting cables to be inserted midspan, two screw holes at ends
d. WMP** - Steel back board with 4 inch deep min, 8 inch wide vertical wire management rings, front enterable. Provide trough at bottom of each column of WMP.
e. WMP**T - Narrow, steel back board with 4 inch deep min, 3 inch wide vertical wire management rings, front enterable.

2. Provide as required to support indicated cable bundle and location.
3. Provide type WMRB at wood frame construction for cable hung from underside of ceiling, unless otherwise noted.
4. Manufacturers:

a. WMRB:

1) B-Line Fasteners, BR Series
2) Senior Industries
3) T&B
4) or equal.

b. WMRC

1) Chatworth Products 12127 and 10812 2” and 3” Wall Mount Closed D Ring.
2) Senior Industries
3) or equal.

c. WMRO

1) Chatworth Products Wall Mount 12035 Open Ring.
2) AllenTel
3) Commscope/Systimax, Inc.
4) Siemon
5) or equal.

d. WMP

1) Siemon S188-*** to match adjacent terminal blocks with S188-WD

2) Ortronics OR-806003194 or OR-806003196 to match terminal blocks.
3) By any manufacturer listed for 110TB under Section 27 11 19 - Communications Termination Blocks and Patch Panels
4) or equal.

e. WMP**T

1) Siemon S110M-WM-*** to match adjacent terminal blocks
2) By any manufacturer of listed for 110TB under Section 27 11 19 - Communications Termination Blocks and Patch Panels
3) or equal.

PART 3 - EXECUTION

3.1 INNERDUCT INSTALLATION

A. Schedule of Application

1. Underground, at Covered Walkways and Above Roof

a. Provide WMID at new and existing ducts used by the work of this project. Provide the WMID in sufficient quantity at each segment to place the indicated fiber cabling plus 1 spare cells. Example: Where the plans indicate provision of 3 OSP fiber cables in a ductbank segment, provide at least two 3-cell WMID.
b. Place fiber cabling and UTP5e-OP meeting the maximum diameter requirements of the WMID manufacturer inside WMID.

1) Each fiber cable to be allocated its own WMID cell.
2) At Contractor's option, combine multiple UTP5e-OP cables in a single WMID cell up to the manufacturer's recommended fill limit.

c. Omit spare cells at 2" duct and conduit. Provide 2 cell WMID.
d. Omit WMID at conduits smaller than 2"

2. At tray conditions and at backboard, cable runway and tray conditions at communications closets, protect fiber cabling with ID Innerduct.
3. At plenum tray conditions, provide IDP.
4. At 2" and larger interior conduits, provide riser or plenum rated WMID as applies when installing backbone cabling.

a. Provide the WMID in sufficient quantity at each segment to place the indicated cabling plus 3 spare cells. Example: Where the plans indicate provision of 3 fiber cables in a conduit, provide at least two

3-cell WMID.

b. Omit spare cells at 2” duct and conduit. Provide 2 cell WMID.
c. Omit WMID at conduits smaller than 2” or for conduits used exclusively for horizontal/interior station cabling.
d. Provide plenum rated WMID at plenum conditions.

3.2 GENERAL

A. Refer to Section 27 13 00 Communications Indoor Backbone Cabling for requirements for cable routing within Communications Rooms.

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SECTION 27 13 00

COMMUNICATIONS INDOOR BACKBONE CABLING

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Work of this Section includes:

1. Indoor Copper Backbone Cabling between Communications Rooms and communications terminal nodes other than station cabling.
2. Indoor Optical Fiber Backbone Cabling between Communications Rooms and communications terminal nodes other than station cabling.
3. Terminate fiber on patch panels as specified in Section 27 1119.
4. Terminate copper cabling on terminal blocks as specified in Section 27 1119.
5. For all cabling:

    a. Test cabling to demonstrate performance to specified standards or better using test equipment and methods as specified in Section 27 1000.
    b. Label cables, jacks, plates and patch panels as specified in Section 27 05 53.
    c. Document on Record Documents as described in Section 27 0500.

B. Related work in other Sections

1. Section 27 0526 - Grounding and Bonding for Communications Systems
2. Section 27 0529 - Hangers and Supports for Communications Systems
3. Section 27 0533 - Conduits and Backboxes for Communications Systems
4. Section 27 0536 - Cable Trays for Communications Systems
5. Section 27 0539 - Surface Raceways for Communications Systems
6. Section 27 0553 - Identification for Communications Systems
7. Section 27 1000 - Structured Cabling, Basic Materials and Methods
8. Section 27 1116 - Communications Cabinets, Racks, Frames and Enclosures
9. Section 27 1119 - Communications Termination Blocks and Patch Panels
10. Section 27 1123 - Communications Cable Management
11. Section 27 1500 - Communications Horizontal Cabling

1.2 REFERENCES

A. Refer to Section 27 1000 - Structured Cabling, Basic Materials and Methods

1.3 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications.

1.4 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1 and Section 27 1000 - Structured Cabling, Basic Materials and Methods.

1.5 SEQUENCING

A. Not Used.

PART 2 PRODUCTS

2.1 COPPER BACKBONE CABLING

A. General

1. Each conductor shall be a minimum of 22 or 24 AWG.
2. Complies with

    a. ICEA S-90-661
    b. ANSI/TIA-568-C.1
    c. ANSI/TIA-568-C.2
    d. NEMA WC 63.1
    e. UL 444

3. Solid conductor 100 ohm multipair UTP (Unshielded twisted pair), formed into 25 pair binder groups covered with a gray thermoplastic jacket.
4. Imprinted with

    a. manufacturers name or identifier,
    b. flammability rating,
    c. gauge of conductor,
    d. transmission performance rating (category designation)
    e. at regular intervals not to exceed 2 feet.

5. The word "FEET" or the abbreviation "FT" shall appear after each length

marking.

6. Provide communications general purpose (CM or CMG), communications plenum (CMP) or communications riser (CMR) rated cabling in accordance with NFPA 70.

    a. Type CMP and CMR may be substituted for type CM or CMG and type CMP may be substituted for type CMR in accordance with NFPA 70.

7. Color coding shall comply with industry standards for 25 pair cables.

B. Inside Distribution Wire, Horizontal

1. Drawing Reference ** pr. T-IDW, where ** refers to required pair count.
2. Construction:

    a. 2 to 600 pair count voice pair cabling in overall jacket.
    b. Meets EIA/TIA Category 3
    c. USOC color code.
    d. NEC Type CM or CMG.
    e. Nominal Outside Diameter, not to exceed the following:

Pair Count	Outside Diameter (inches)
6 pr.	0.23
12 pr.	0.25
25 pr.	0.34
50 pr.	0.47
100 pr.	0.64
200 pr.	0.97
300 pr.	1.07
400 pr.	1.30
600 pr.	1.50

3. Manufacturer:

    a. Superior/Essex
    b. General Cable
    c. Mohawk
    d. NORDX/CDT
    e. or equal.

C. Inside Distribution Wire, Riser

1. Drawing Reference ** pr. T-IDW-R, where ** refers to required pair count.
2. Construction:

a. 25 to 600 pair count voice pair cabling in overall jacket.
b. PVC jacket
c. USOC color code.
d. NEC Type CMR
e. Meets EIA/TIA Category 3.
f. Nominal Outside Diameter, not to exceed the following:

Pair Count	Outside Diameter (inches)
25 pr.	0.54
50 pr.	0.70
100 pr	0.86
200 pr.	1.20
300 pr.	1.30
400 pr.	1.50
600 pr.	1.90

3. Manufacturer:

a. Superior/Essex
b. General Cable
c. Mohawk
d. NORDX/CDT
e. or equal.

D. Inside Distribution Wire, Plenum

1. Drawing Reference ** pr. T-IDW-P, where ** refers to required pair count.
2. Construction:

a. 25 to 600 pair count voice pair cabling in overall jacket.
b. Plenum rated jacket
c. USOC color code.
d. NEC Type CMP
e. Meets EIA/TIA Category 3.
f. Nominal Outside Diameter, not to exceed the following:

Pair Count	Outside Diameter (inches)
25 pr.	0.54
50 pr.	0.70
100 pr	.0.86
200 pr.	1.20
300 pr.	1.30
400 pr.	1.50
600 pr.	1.90

3. Manufacturer:

    a. Superior/Essex
    b. General Cable
    c. Mohawk
    d. NORDX/CDT
    e. or equal.

2.2 FIBER OPTIC COMMUNICATIONS CABLING AND RELATED:

A. Fiber Optic Cable, Inside Distribution, Breakout Cable:

1. Drawing References:

    a. XX FOS-IDW SingleMode, where XX indicates fiber count.
2. Refer to Section 27 10 00 - Structured Cabling, Basic Materials and Methods, including Fiber Cable Construction, General and Fiber, Single Mode, General, as applies.
3. Application: In-building Distribution. Breakout Cable Applications
4. Approvals: Where used outside conduit, OFN, OFNP, OFNR per NEC 770-51, as applies.

5. Construction:

    a. Refer additionally to Fiber Cable Construction, General, elsewhere herein.
    b. Suitable and approved for indoor use.
    c. Tight buffer
    d. At least one ripcord to facilitate sheath removal.
    e. Breakout style construction, with individual jacket per fiber with overall outside jacket.
    f. Maximum Cable Diameter:

        1) 2 Fibers: .236"
        2) 4 Fibers: .285"
        3) 6 Fibers: .363"
        4) 8 Fibers: .437"
        5) 10 Fibers: .473"
        6) 12 Fibers: .506"

    g. Performance:

        1) Maximum attenuation per EIA/TIA-455-61

2) Singlemode
   (a) 1300 nm: = 1.0 dB/km
   (b) 1550 nm: = 1.0 dB/km

h. Maximum required bend radius:

1) At installation: 15x's diameter
2) Long term application: 10x's diameter

i. Minimum Safe Longitudinal Load:

1) At installation,
   a) 2 Fibers: 150 lbs
   b) 4 Fibers: 290 lbs
   c) 6 Fibers: 380 lbs
   d) 8 Fibers: 480 lbs
   e) 10-12 Fibers: 575 lbs

2) Long term application:

   a) 2 Fibers: 25 lbs
   b) 4 Fibers: 90 lbs
   c) 6 Fibers: 115 lbs
   d) 8 Fibers: 145 lbs
   e) 10-12 Fibers: 75 lbs

3) Crush resistance: 250 lb/inch
4) Impact Resistance: 3.6 ft-lbs, 10 impacts
5) Flex, Twist/Bend 1000 cycles, 22 lbs, 10 x O.D. radius

j. Manufacturer, subject to above:

1) Corning Cable Systems Fan-Out.
2) Alcatel Cable Systems
3) AMP
4) Belden 225XXX Series
5) Berk-Tek
6) Brand-Rex
7) Chromatic Technologies, Inc.
8) Commscope/Systimax Lightguide

   a) CommScope Uniprise

9) Mohawk
10) Optical Cable Corp B Series
11) or equal.

B. Fiber Optic Cable, Riser:

1. Drawing References:

    a. XX FOS-R Singlemode, where XX indicates fiber count.
2. Refer to Section 27 10 00 - Structured Cabling, Basic Materials and Methods, including Fiber Cable Construction, General and Fiber, Single Mode, General, as applies.
3. Application: Intra-building distribution in building risers and below building crawl space.
4. Listing: Meeting NEC OFNR, Listing by nationally recognized testing agency.

    a. Construction:

        1) Refer additionally to Fiber Cable Construction, General, elsewhere herein.
        2) Jacket: Subject to listing and rating for vertical riser cable.
        3) Tight Buffer construction only, “Core Lock” not required.
        4) Otherwise as for FO*-OP, except for construction affecting listing.

    b. Dimensions, not to exceed the following:

        1) 1 to 4 Fibers:0.20"
        2) 5 to 12 Fibers: 0.28"
        3) 12 to 24 Fibers:0.50"
        4) 25 to 60 Fibers: 0.80"
        5) 61 to 108 Fibers:0.90"
        6) 109 to 144 Fibers:1.10"

    c. Performance:

        1) As for FO*-OP.

    d. Manufacturer:

        1) Any meeting requirements of Fiber Optic Cable, Outside/Inside Plant, Riser, Constrained Diameter, specified elsewhere herein.
        2) Optical Cable Corp Ultrafox construction
        3) Corning Cable Systems MIC.
        4) BerkTek.
        5) Chromatic Technologies, Inc.
        6) Mohawk/CTD.
        7) Commscope/Systimax.
        8) Belden.

9) or Equal.

C. Fiber Optic Cable, Plenum:

1. Drawing References:

   a. XX FOS-P Singlemode, where XX indicates fiber count.

2. Refer to Section 27 10 00 - Structured Cabling, Basic Materials and Methods, including Fiber Cable Construction, General and Fiber, Single Mode, General, as applies.
3. Application: Intra-building distribution in building plenum and duct space
4. Listing: Meeting NEC OFNP, Listing by nationally recognized testing agency.

5. Construction:

   a. Refer additionally to Fiber Cable Construction, General, elsewhere herein.
   b. Jacket: Subject to listing and rating for plenum cable.
   c. Tight Buffer construction only, “Core Lock” not required.
   d. Otherwise as for FO*-OP, except for construction affecting listing.

6. Dimensions, not to exceed the following:

   a. 1 to 4 Fibers: 0.20"
   b. 5 to 12 Fibers: 0.28"
   c. 12 to 24 Fibers: 0.50"
   d. 25 to 60 Fibers: 0.80" e. 61 to 108 Fibers: 0.90" f. 109 to 144 Fibers: 1.10"

7. Performance:

   a. As for FO*-OP.

8. Manufacturer:

   a. Any meeting requirements of Fiber Optic Cable, Outside/Inside Plant, Riser, Constrained Diameter, specified elsewhere herein.

D. Fiber Optic Cable, Outside Plant, Riser and Inside, Constrained Diameter:

1. Drawing References:

   a. XX FOS-OPR Singlemode, where XX indicates fiber count.

2. Fiber and Application:

   a. Inter-building and intra-building distribution in building risers, below building crawl space, manholes and site conduit.
   b. Specifically suitable for continuous splice free entry into building from OSP interior past without distance limits due to construction and/or cable diameter.

3. Refer to Section 27 10 00 - Structured Cabling, Basic Materials and Methods, including Fiber Cable Construction, General and Fiber, Single Mode, General, as applies.

4. Listing: UL OFNR. Meeting NEC OFNR

5. Construction:

   a. Suitable and approved for wet location. Meets requirements for FO*-OP where installed in those locations.
   b. As for FO*-R with not to exceed dimensional constraint. as follows:

Fiber Count	Overall Cable Diameter (in.)
2	0.18
4	0.20
6	0.22
8	0.24
10	0.26
12	0.28
14	0.28
16	0.28
18	0.28
24	0.31
30	0.35
36	0.35
48	0.41
60	0.43
72	0.47
84	0.51
96	0.55
108	0.55
120	0.59
132	0.61
144	0.63
156	0.71

6. Performance:

a. As for FO*-R.

7. Manufacturer:

a. Corning Cable Systems FREEDM LST.
b. Optical Cable Corp
c. Commscope/Systimax LazrSPEED/OptiSPEED
d. Commscope Uniprise Indoor/Outdoor
e. Mohawk/CDT RiserLite.
f. Berk-Tek UNI-Lite RD.
g. Belden
h. or equal.

PART 3 EXECUTION

3.1 FIBER OPTIC CABLING PRACTICE

A. Service Loop

1. At each Telecommunications Room, provide at least 15 feet of fiber in excess of that required to reach the patch panel by a dressed route. Form into a storage loop and fix in place as directed by the Owner's Representative with an FMR.

B. Splicing:

1. Interior: Provide splice-free cabling.
2. Exterior: Do not splice at exterior unless splicing is indicated on Plans. In such circumstances, provide fusion splices.

C. Termination Methods

1. Review proposed breakout procedure with the Owner's Representative before beginning this work.
2. Use full cable breakout method. Display both connectorized and non-connectorized fibers entering a patch panel.
3. Remove sheath so that no more than 4 inches of unstripped cable enters the panel.
4. Strip back a sufficient amount of cable so that fiber strands wrap at least one full wrap, circle or figure eight, inside the panel with the connectorized ends attached to the most distant bulkhead connectors.
5. Group together the fibers from each binder group with 0.125 inch nylon spiral wrap. (Commscope/Systimax, Panduit, Corning Cable Systems SAN-DT25-06, or equal.)

D. Outside Plant

1. Obtain allowable pulling tension for underground fiber cable from the manufacturer. Use pulling equipment with tension gauges to verify that cable pulls do not exceed allowable pulling tension.
2. Loose Tube, Gel Filled Cabling - No flow of filling when tested in accordance with FOTP-81.

E. Loose Tube Breakout

1. Install breakout tubing over the full exposed length of the fiber strands.
2. Install buffer tubing on all strands, including those not being connectorized as part of this Contract.
3. Reinforce and protect the junction of the cable sheath and buffer tubing using a method approved by the Owner's Representative before beginning this work.

3.2 COPPER BACKBONE TIE CABLE INSTALLATION AND TERMINATION

A. General:

1. Backbone cable(s) shall be installed in conduit system unless otherwise noted.

B. Sequencing:

1. If the installation of a tie cable requires the disconnection and removal of any existing cable(s) carrying active service prior to installation

   a. Notify the Owner's Representative no less than 5 working days in advance of when this work is to be performed.

2. When this work is performed, the newly installed cables must be installed, tested and passed in one 24 hour period beginning when the active service on the existing cable is interrupted.

C. Routing

1. Backbone cables are to be routed neatly on overhead cable runway to block termination locations. For cable management from cable runway to block termination and the dressing of cable at the blocks, follow manufacturer's specifications, instructions, and recommendations and standard industry practices.
2. At the termination end of multi-pair riser cables, the Contractor shall provide 15 feet (15') of managed service slack.

D. Termination

1. If removal of the cable jacket is required to facilitate routing of

backbone cable into the blocks, the exposed cable pairs shall be fully covered with black or gray plastic tape, neatly lapped to prevent gaps.

a. Mount 110 termination fields per manufacturer's specifications, instructions, and recommendations. Use accompanying construction drawing set to determine mounting locations and configurations.
b. 110 C4 blocks shall be used for all but the last position on each twenty-five (25) pair row of a 110 one-hundred (100) pair field and C5 blocks for the last five (5) pair positions in each twenty-five (25) pair row.

E. Installation of Tie Cable:

1. All tie cable between terminal blocks at IDF rooms shall be continuous, unspliced runs.
2. Termination of Voice or Shared Use Tie Cable:

a. Cable shall be terminated on the 110 Type punch blocks system using C4 connecting blocks in the following order.

1) Terminate pairs and groups in order top to bottom and then left to right according to insulation or binder color as listed below.
2) "Mate" is the first wire of the pair to be terminated, "Wire" is the second.

b. Comply with the following table:

Group or Pair Number	Mate	Binder or Wire
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown
5	White	Slate
6	Red	Blue
7	Red	Orange
8	Red	Green
9	Red	Brown
10	Red	Slate
11	Black	Blue
12	Black	Orange
13	Black	Green
14	Black	Brown
15	Black	Slate
16	Yellow	Blue
17	Yellow	Orange
18	Yellow	Green

19	Yellow	Brown
20	Yellow	Slate
21	Violet	Blue
22	Violet	Orange
23	Violet	Green
24	Violet	Brown
25	Violet	Slate

3. Cables containing pair counts of 50 or greater shall be terminated as follows:

    a. Columns of punch blocks stacked 2 high shall be mounted on the backboard.
    b. Beginning at the top right of the 1st column, first the blue binder will be punched down, followed by the orange binder directly beneath it.
    c. Binder punch will continue top to bottom, and then left to right until the entire cable has been terminated.
    d. Thus a 50-pair cable requires two punch blocks.
    e. Upon completing the termination of all cables within an IDF, install a clear plastic cover at each punch block.

3.3 ENTRANCE FACILITY LAYOUT

A. General:

1. Final backboard and cable runway design layout within the Communications Rooms shall be approved by the Owner’s Representative prior to work beginning.
2. Reference the design basis layout in the plans and bring to the Owner’s Representative's attention any field conditions that would prevent installation as shown on the plans. Submit for resolution in a timely manner.

B. Layout of cable around backboard:

1. All cables shall be formed around the backboard before either rising or dropping vertically to the punch blocks on which they are to be terminated.
2. All cables shall be organized in Wire Management Rings, Split D, Type WMRO. No tywraps or similar bindings are permitted.

C. For outside plant, flooded cables entering the Communications Room:

1. Transition in a splice case to non-flooded cable prior to termination on protector blocks for voice pairs, or on an unprotected 110 block for

systems pairs, where such are indicated. Where systems pairs are not indicated, assume all pairs are for voice use.

2. Position the splice case on the backboard where accessible for future service. Orient parallel to floor to prevent continuous gel flow from OSP cabling. Place on cable tray only where such placement is indicated on the plans.

****

SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. The horizontal link portion of the cabling system specified in this section extends from the jack termination of the cable at the Work Area Outlet (WAO) faceplate to its patch panel jack termination in its assigned IDF (TR). It also applies to the voice cross-connect system described below.

B. Section includes, but is not necessarily limited to provision of:

1. Horizontal Station Cabling

    a. Horizontal copper station cabling, meeting ANSI/TIA Category 6 and ANSI/TIA Category 6A standards, homerun from receptacles to indicated IDF or MDF. Terminated on rack mounted patch panels, as indicated.

2. For all cabling:

    a. Terminate on patch panels as specified in Section 27 1119.
    b. Test cabling to demonstrate performance to specified standards or better using test equipment and methods as specified in Section 27 1000.
    c. Label cables, jacks, plates and patch panels as specified in Section 27 0553.
    d. Document on Record Documents as described in Section 27 0500.

C. Related Documents:

1. Specification Section 27 0500 - Common Work Results for Communications applies to this Section.

D. Related Work in Other Sections:

1. Section 27 0529 - Hangers and Supports for Communications Systems

    a. J-hooks and hangers for the work of this Section

2. Section 27 0533 - Conduits and Backboxes for Communications Systems

    a. Empty raceway for the work of this Section.

3. Section 27 0536 - Cable Trays for Communications Systems

    a. Empty tray for the work of this Section.

4. Section 27 0539 - Surface Raceways for Communications Systems

    a. Empty raceway for the work of this Section.

5. Section 27 0553 - Identification for Communications Systems

    a. Labeling systems and execution for the work of this Section.

6. Section 27 1119 - Communications Termination Blocks and Patch Panels

    a. Specification for patch panels and blocks used by work of this Section

7. Section 27 1123 - Communications Cable Management

    a. Specification for innerduct, backboard and patch cord management used by the work of this Section.

1.2 REFERENCES

A. As listed in Section 27 1000.

1.3 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 0500 - Common Work Results for Communications.

1.4 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Division 1 and Section 27 1000 - Structured Cabling, Basic Materials and Methods.

1.5 SEQUENCING

A. Coordinate the installation of the horizontal cabling with the other work of this Project, or Projects simultaneously in progress in each building of the project. The Contractor shall ensure that construction and preparation of the rooms and spaces in which the work of this Section are to be installed are sufficiently complete before beginning work.

B. Removal, replacement and re-installation of communications materials and equipment required to permit the completion or correction of other building

trade work that is the work of this Project shall be done at no cost to the Owner or impact to the project schedule.

PART 2 - PRODUCTS

2.1 COPPER STRUCTURED CABLING SYSTEMS

A. General

1. Provide horizontal cable in compliance with NFPA 70 and performance characteristics in accordance with TIA/EIA-568-C

B. Definitions

1. Keystone Opening: A communications industry standard rectangular opening in a wall plate or patch panel having nominal dimensions of 0.58" wide and .76" high and designed to securely mount industry standard keystone jacks.

C. Intervendor compatibility

1. Keystone Jack Compatibility test.

   a. Any jack or panel system proposed as meeting the keystone compatibility requirements of this specification shall be able to interchangeably mount or mount in (as applies) Leviton Quickport series components.
   b. Systems exhibiting excess play, inability to insert, inability to remove, damage to the plate or jack or occupying excessive area behind the plate opening will not be accepted.

2.2 COPPER CABLING, CATEGORY RATED DATA/VOICE

A. General

1. Provide horizontal cable in compliance with NFPA 70 and performance characteristics in accordance with ANSI/TIA-568-C

2.3 COPPER CABLING, CATEGORY RATED DATA/VOICE

A. High Speed, ANSI/TIA Category 6 Cabling

1. Drawing Reference: ** UTP6-4, where ** denotes cable count

2. Construction:

a. Provide horizontal copper cable in accordance with:
   1) ANSI/TIA-568-C.2,
   2) UL 444
   3) NEMA WC 66 (Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pair)
   4) ICEA S-90-661

b. UTP (unshielded twisted pair),
c. 100 ohm impedance
d. Four each individually twisted pair, 22 or 24 AWG conductors,

   1) Color code:

      a) Pair 1 White/Blue Blue
      b) Pair 2 White/Orange Orange
      c) Pair 3 White/Green Green
      d) Pair 4 White/Brown Brown

e. No shield in the sheath.
f. Jacket

   1) Thermoplastic jacket
   2) Color: Green unless otherwise indicated.
   3) Cable imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular intervals not to exceed 2 feet.
   4) The word "FEET" or the abbreviation "FT" shall appear after each length marking.
   5) Provide communications general purpose (CM or CMG), communications plenum (CMP) or communications riser (CMR) rated cabling in accordance with NFPA 70.
   6) Type CMP and CMR may be substituted for type CM or CMG and type CMP may be substituted for type CMR in accordance with NFPA 70.

3. Certification

   a. Warrantied by the manufacturer to provide Category 6 performance when installed in accordance with applicable ANSI/TIA standards and when terminated with the jacks supplied by the Contractor for this Project.

4. Performance

   a. Assembly electrically meets or exceeds ANSI/TIA 568-C.2

Category 6 performance standards

5. Manufacturers:

    a. Berk-Tek LANmark-6 or LANmark-1000
    b. Amp
    c. Belden/CDT
    d. Commscope/Systimax
    e. Commscope/Uniprise
    f. General Cable
    g. Hitachi
    h. Mohawk/CDT
    i. NORDX/CDT
    j. Superior/Essex
    k. or equal

B. High Speed, Category 6 Cabling, Plenum Rated

1. Drawing Reference:** UTP6-4P, where ** denotes cable count
2. Construction:

    a. As for non-plenum, with fire retardant overall jacket construction.
    b. National Safety Agency - UL or ETL listed, NEC compliant for plenum installation.

3. Manufacturers

    a. As for non-plenum Cat. 6, plenum construction.

C. High Speed, Category 6 Cabling, Outside Plant

1. Drawing Reference: ** UTP6-4OP or UTP6-OSP, where ** denotes cable count.
2. Construction:

    a. Exceeds TIA/EIA 568-C.2 CAT 6, ISO/IEC 11801:2002 CAT 6, & IEC 61156-5 CAT 6 Horizontal Cable
    b. Suitable for placement in duct below grade subject to extended exposure to standing water. Cable includes flooded construction for moisture protection.
    c. Jacket: Water resistant linear low density polyethylene or equivalent construction.
    d. Inner jacket: Water resistant linear low density polyethylene or equivalent construction.
    e. Insulation: Solid polyolefin or equivalent construction.
    f. Filling Compound: 80 degree centigrade extended thermoplastic rubber or equivalent construction.

3. Listing: At least Type CM.
4. Manufacturer

    a. Mohawk VersaLAN OSP Category 6
    b. BerkTek
    c. CommScope
    d. General/Essex.
    e. Belden.
    f. or equal.

D. High Speed, Category 6A Cabling, Plenum Rated

1. Drawing Reference:** UTP6A-4P, where ** denotes cable count
2. Construction

    a. Cable construction shall be four twisted pairs of 24 AWG insulated solid conductors.
    b. Fire-retardant overall jacket construction meeting NFPA 70 CMP listing.
    c. UL listed, NEC compliant for plenum installation.
    d. Cable shall be manufactured with an “X”-shaped pair-divider along the center to maintain separation of individual pairs.
    e. Conductor diameters shall be 0.0224” .0003” solid copper.
    f. Conductor insulation diameter shall be 0.039” .0005” fluoro copolymer.
    g. Twist lay of each pair shall vary in a manner to optimize noise immunity and minimize crosstalk.
    h. UL or ETL agency certification or verification markings shall be marked on the cable jacket according to the certifying agency’s requirements.
    i. Color coding of the pairs shall be as follows:

        1) Pair 1: White/Blue; Blue
        2) Pair 2: White/Orange; Orange
        3) Pair 3: White/Green; Green
        4) Pair 4: White/Brown; Brown

3. Performance Requirements

    a. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
    b. Cable shall exceed Category 6A transmission requirements specified in ANSI/TIA/EIA-568-C.2, and shall be tested through 550 MHz.
    c. Worst case electrical performance characteristics shall be as follows:
    d. Characteristic Impedance: 100 + 15 Ohm (1.0-100 MHz) 100 + 20 Ohm (101-250 MHz)
    e. Maximum Conductor Resistance: 9.38 ohm /100 Meters @ 20°C

f. Maximum Resistance Unbalance: 3%
g. Maximum Mutual Capacitance: 5.6 nF/100 Meters @ 1 kHz
h. Maximum Capacitance Unbalance: 330 pF/100 Meters
i. Maximum Delay Skew: 25 ns/100 Meters
j. Cable shall be UL and c (UL) listed.
k. Cable shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.

4. Environmental Minimum operating conditions meet or exceed:

   a. Installation: 0°C to +50°C
   b. Operation: -10°C to +60°C

5. Jacket color:

   a. Yellow

6. Manufacturers:

   a. BerkTek LANmark-10G2 Plenum
   b. Belden 10GX Plenum
   c. Commscope/Systimax 360 GigaSPEED X10D 2091Plenum
   d. General GenSpeed 10MTP Plenum
   e. Mohawk Giga LAN 10 Plenum
   f. Superior/Essex 10Gain XP Plenum
   g. or equal

E. High Speed, Category 6A Cabling, Riser Rated

1. Drawing Reference:** UTP6A-4, where ** denotes cable count
2. Construction:

   a. As for plenum, but with manufacturer's riser rated jacket construction.
   b. National Safety Agency - UL or ETL listed, NEC compliant for riser installation.

3. Manufacturers

   a. As for plenum Cat. 6A, riser construction.

F. High Speed, Cat 6A Cabling, Outside Plant

1. Drawing Reference:** UTP6A-4OP, where ** denotes cable count
2. Minimum Features, Functions, Construction:

   a. Pair Count: 4
   b. Conductor: Solid annealed copper

c. Insulation: Polyolefin
d. Separator: CAT 6A: Polyolefin cross-web
e. Inner Shield: Electrically continuous 0.008 in (0.20 mm) polymer coated smooth aluminum tape shield, applied with an overlap
f. Dry Water Block: SAP powder
g. Jacket Black, sunlight and weather resistant polyethylene
h. Characteristic Impedance : Ohms 100 ± 15
i. Nominal Velocity of Propagation %: CAT 6A: 68
j. Performance Compliance

1) ANSI/TIA-568-C.2. Meets Category 6A
2) ANSI/ICEA S-107-704-2012
3) RoHS-compliant/RoHS 2-compliant
4) REACH-compliant

k. Max Diameter: less than .4”

3. Environmental

a. Operation: -40°F to +167°F (-40°C to +75°C)
b. Suitable for installation in underground ductbank

4. Manufacturer:

a. Superior Essex BBDN6A
b. Or equal (no known equal).

2.4 WORK AREA OUTLETS

A. Data Jacks Performance Requirements, General

1. Jack

a. Construction:

1) High impact, flame retardant UL-rated 94V-0 thermoplastic.
2) The jack shall be designed with an integral locking mechanism which, upon insertion of a modular plug, provide maximum pullout strength at the plug/jack interface.
3) Industry standard keystone construction.

b. Performance - The jack shall meet or exceed the following standards.

1) TIA/EIA 568C.1
2) UL listed
3) FCC Part 68, Subpart F

4) Electrical - The modular jacks shall meet the following electrical performance and certification requirements.

   a) Insulation resistance - 500 MO maximum
   b) Dielectric withstand voltage
   c) 1000 VAC RMS, 60 Hz minimum, contact to contact
   d) 1000 VAC RMS, 60 Hz minimum to exposed conductive surface
   e) IEEE and Cisco Power over Ethernet power dissipation standards.
   f) Contact Resistance - 20 mO maximum
   g) Current Rating - 1.5 amps at 68 degrees F (20 degrees C) per IEC Publication 512-3, Test 5b.

5) Physical - The modular jacks shall meet the following physical requirements.

   a) Connector-insulation displacement connectors accepting 22 and 24 gauge AWG solid conductor wire.
   b) Jack wires-square copper alloy wires with 50 micro-inch lubricated gold plating over 100 micro-inch nickel plate
   c) Stamped crossover lead frame conductor paths
   d) Wired to meet EIA 568C.1 and T568B Color Code

6) Color:

   a) Jacks: Green
   b) Blank jack cover: To match plate.
   c) “C6” or equivalent molded on face of jack.

7) Mechanical - The modular jacks shall meet the following mechanical requirements

   a) Plug insertion - minimum 750 plug insertions
   b) Contact Force - 100 grams minimum using FCC-approved modular plugs
   c) Plug Retention Force: 30 lb (133 N) minimum between modular plug and jack
   d) Temperature Range: -40 to 150 degrees F

c. Blank connector modules.

   1) Features.
   2) Snaps into faceplate, fills blank openings.

2. Manufacturers - Jacks, subject to keystone interchangeability requirement:

a. Leviton eXtreme 6+ Connector
b. Panduit Netkey Keystone Jacks
c. Hubbell NextSpeed Xcelerator
d. ADC/Krone
e. AMP SL Series - 1375187 Category 6 jack.
f. Hellerman-Tyton Megaband
g. Ortronics Keystone.
h. 3M
i. Siemon Max 6 MX5-K series
j. or equal.

3. Manufacturers - Blank Module.

a. Leviton SnapIn Blank Module
b. Hubbell SFB
c. equal by listed jack manufacturers
d. or equal.

B. Category 6A Data Jacks Performance Requirements, General

1. Construction:

a. Category 6 Jacks shall be standard FCC-compliant 8-position, un-keyed RJ-45 style, with snap-in mounting features.
b. Jacks shall be designed for 4-pair, 100 ohm balanced and unshielded twisted pair (UTP) cables.
c. Jacks shall be a two-piece construction, consisting of a zinc die cast body and zinc die cast pre-termination module.
d. Jack body and pre-termination module shall have integral molded thermoplastic insulators to form the mating interface, isolate and maintain proper contact locations, and to suppress crosstalk (NEXT/FEXT).
e. Jack die cast body shall have an integral male spade connector for connecting a ground jumper wire.
f. Jack die cast body shall have features to anchor and strain relieve the cable jacket, and to bond the shield and drain wire to ground.
g. The die cast/plastic pre-termination module shall have two levels of wire positioning, with wire management features that provide both strain relief and specific orientation.
h. The orientation and positioning of the wire management features shall be designed to optimize crosstalk (NEXT/FEXT) performance and alien crosstalk (ANEXT/AFEXT) performance.
i. The die cast pre-termination module shall be removable to permit re-termination of the jack.
j. Termination method for the jack shall require no special tools.
k. Each jack shall be single unit construction.

l. Jack housings shall be a zinc die cast metal construction.
m. Jacks shall have a temperature rating of -10 ºC (14º F) to 70ºC (158º F).
n. Jacks shall utilize a printed circuit board to control near-end crosstalk (NEXT).
o. Assembled jack design shall incorporate suppression of alien cross-talk (ANEXT) in compliance with ANSI/TIA/EIA-568-C2 requirements.
p. Jack housings shall fully encase and protect printed circuit board and IDC contact fields.
q. Jack RJ-45 contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
r. RJ-45 contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
s. Contacts shall be formed flat for increased surface contact with mated plugs.
t. Contacts shall have an inversely oriented right-angle orientation to maximize crosstalk (NEXT/FEXT) and alien crosstalk (ANEXT/AFEXT) performance.
u. Contacts shall be constructed of Beryllium copper for maximum spring force and durability.
v. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inch of nickel.
w. Jack termination method shall utilize industry standard 110 IDC wire termination, using standard parallel jaw pliers to engage the pre-termination module to the die cast housing.
x. IDC contacts in the jack body shall be arranged in staggered arrays of 4 sets of 2 contacts to suppress NEXT and ANEXT.
y. Jacks shall have the Category 6 designation, visible from the front when installed.
z. IDC contacts shall be Phosphor Bronze with 100 micro-inch tin lead 60/40 plating over nickel.
aa. Jacks shall terminate 24-22 AWG solid conductors.
ab. Jacks shall terminate insulated conductors with outside diameters up to .050”. ac. Jacks shall not require special cords, specialty tools or special installation requirements.
ad. Jacks shall have attached wiring instruction labels to permit T568B wiring configurations.
ae. Category 6A jacks shall be lead-free ROHS compliant.

2. Performance Requirements

a. All transmission parameters shall be independently verified by a UL or ETL third party testing organization. Transmission testing shall be

to 625 MHz.

b. Category 6A jacks shall exceed transmission requirements specified in ANSI/TIA/EIA-568-C.2.
c. Jacks shall be UL LISTED 1863 and CSA certified.
d. Jacks shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
e. Jacks shall be third party verified to 10 Gigabit Ethernet performance according to IEEE 802.3an.
f. Category 6A jacks shall meet or exceed 4-connector channel performance requirements of ANSI/TIA/EIA-568-C.2 standard.

3. Blank connector modules.

   a. Features.

      1) Snaps into faceplate, fills blank openings.

4. Color

   a. Jack Color Standards:

      1) Yellow

   b. Blank jack cover: Match plate.

5. Manufacturers - Jacks:

   a. As for Cat6 with Cat 6A performance

6. Manufacturers - Blank Module.

   a. As for Cat 6.

C. Telecommunications Outlets, Copper Jacks, Wall Mount, Flush

1. Drawing Reference(s):

   a. MMP4
   b. MMP6

2. Assembly. Provide complete telecommunications outlet assembly, including but not limited to:

   a. Faceplate with industry standard keystone openings
   b. Blank connector modules at faceplate openings not filled with connector modules.
   c. Labels and label holders.

3. Faceplate.

    a. Features:

        1) Single gang.
        2) Front Loading
        3) Openings for up to 4 keystone jack connector modules - MMP4, up to 6 openings - MMP6.
        4) Flat face faceplates.
        5) Label holders with space to label the plate number and the number of each jack.

    b. Color: To match electrical receptacles and switch plates mounted on same wall,

4. Manufacturers - flat plates, subject to keystone interchangeability requirement:.

    a. Leviton Quickport Multimedia MOS Single Gang Wall Plates and Adapters.
    b. Panduit Netkey
    c. Hubbell InfineStation Series Faceplates and Adapters
    d. AMP SL Series plates and Adapters
    e. ADC/Krone
    f. Hellerman Tyton Modular Faceplates
    g. 3M
    h. Ortronics Keystone
    i. Lutron keystone.
    j. or equal.

D. Duplex Jack Frame, 1 To 4 Receptacles

1. Drawing Reference: DJF4
2. Construction:

    a. Supports jacks as listed for MMP6 in a duplex electrical opening (NEMA 106 format).
    b. Modular, with keystone snap-in receptacle options as scheduled.
    c. Options for 1 to 4 receptacles per plate
    d. Otherwise as for MMP6 above.

3. Manufacturers:

    a. Leviton 41087-Q*P
    b. Pass & Seymour AC-QP106
    c. Hubbell.
    d. Manufacturers listed for MMP6 above

e. or equal.

E. Voice Telephone, Station Plates & Jack/Receptacles

1. Drawing References:

   a. Wall Mounted Telephone, Flush:
   b. 630A

2. Station jacks shall be modular four or 8 wire type and conform to FCC Part 68.
3. Construction, where not otherwise specified, scheduled or indicated:

   a. Cat 6 Modular as specified above.
   b. Jack is fully recessed behind plate.
   c. Spring Wire Contacts, at least 50 microinches gold on 100 microinches nickel.
   d. Mechanically fastened to Building or Similar. Adhesive fastening not acceptable.
   e. Stainless Steel or High Strength 94VO plastic.
   f. Mounts to Single Gang Ring, Single Gang Box or Surface Mounted to Wall or to opening in Surface Raceway - Refer to Schedule on Plans.
   g. Single Gang Wall Plate with two integral wall telephone mounting studs.
   h. Insulation displacement (punchdown) termination.

4. Manufacturers, Flush Wall Mounted Wall Telephone.

   a. Hubbell P630S1GJ8.
   b. Leviton 4108W-OSP
   c. or equal using listed plate and jack from one of the listed manufacturers to Category 6 jacks elsewhere herein above.
   d. or equal.

F. Modular Furniture Receptacle Plates, 1 To 4 Receptacles, Universal Fit

1. Drawing Reference: OMP
2. Construction:

   a. Modular, with snap-in receptacle options as scheduled.
   b. Universal fit adjustable latches plate bezel mount fits at least Haworth - Premise, Knoll Ref and Steelcase systems.
   c. Colors of plates, mounting screws and inserts to be selected by Owner's Representative.
   d. Options for 4 jacks per plate.
   e. Otherwise as for MMP6 above.

3. Manufacturers:

    a. As for MMP6
    b. or equal.

G. MultiMedia Surface Mount Box

1. Drawing Reference (s):

    a. * MMSB, where * represents the number of Category connectors of the type specified elsewhere herein.
    b. Biscuit Box

    c. Features Functions

        1) Surface mount enclosure holds terminated station cabling with Category connectors parallel to face of mounting surface.
        2) Mechanically fastened to enclosure surface.
        3) 2 part assembly includes fixed mounting base plate and removable cover over terminations

    d. Manufacturers:

        1) Leviton Quickport Surface Mount Boxes
        2) Panduit Netkey
        3) Hubbell
        4) AMP
        5) Or equal.

PART 3 - EXECUTION

3.1 SIGNAL POLARITY AND COLOR CODE CONVENTION

A. Category 6 Station Wire, RJ45 - Per EIA/TIA-568, designation T568B

3.2 STATION CABLE INSTALLATION AND TERMINATION PROCEDURES

A. General:

1. All cable runs shall be installed per manufacturer's installation instructions.
2. Cable installation is “home-run” between the jack termination of the cable at the faceplate to the patch panel jack termination in its assigned IDF (TR).

a. Each cable shall be installed without any splices.
b. Each cable shall be installed without intermediate termination points unless approved by the Owner's Representative.

B. Run Lengths:

1. Station, Horizontal and IDF Links, Copper:

a. The total length of any horizontal station cable from jack termination of the cable at the WAO faceplate to the patch panel jack termination in its assigned IDF (TR) shall not exceed ninety meters (90m) - two hundred ninety-five feet (295') - unless approved by the Owner's Representative.

3.3 CEILING TILE

A. Ceiling tile shall be removed as necessary for the cable installation and put back in place without damaging or soiling any of the tiles or supporting framework.

B. Ceiling tile shall be handled so no fingerprints or marks are left on the tiles, and the tiles are not damaged in any way.

C. The Contractor is responsible for the cost of repair or replacement of any tile or ceiling tile support/framework hardware that is damaged or soiled by the Contractor..

3.4 WAO HORIZONTAL CABLE PLACEMENT

A. No cable shall run unsupported by conduit, cable tray, hangers, or other specified support for distances greater than five feet (5').

B. No cable shall be attached to the suspended ceiling structure or laid directly on the ceiling tiles or hard lid as a means of support, and the bottom of a cable or cable bundle shall be minimum of six inches (6") above the ceiling tile grid.

C. No cable or cable bundle shall be supported by or attached by any means to fire sprinkler heads, delivery system hardware, environmental sensor system hardware, or the exterior of any conduit, ladder rack, or cable tray. Cable shall be supported by systems specifically installed for cable support.

D. Where cable being installed is not enclosed in conduit or cable tray, cross all electrical power circuit transport at right angles.

E. Where discontinuity of cable trays or conduit pathway occurs that causes

cable or cable bundle to sag vertically three inches (3") or more, support the cable or cable bundle over the discontinuity using hangers, brackets, hooks, rings, and other applicable supporting devices specified in Section 27 05 29 - Hangers and Supports for Communications Systems.

F. During placement of cable runs, do not exceed manufacturer's maximum pulling tension or minimum bend radius limits.

G. Do not bundle cables in cable trays.

H. Do bundle two (2) or more cables with plenum-rated Velcro ties that are snug but which do not deform the cable geometry as follows:

1. Whenever cables in cable trays leave the cable tray and enter/exit distribution conduit.
2. Wherever cables enter a TR. Maintain bundling within the TR.

I. Manage slack to avoid excess cable or kinking.

J. Pull new pulling string through all conduits while placing new horizontal cable. Leave a pulling string in the utilized conduits for future use.

K. Do not roll or store cable reels without an appropriate underlay.

L. Cables with jackets that are chaffed, burned, have exposed internal conductor insulation, or have any bare copper (shiners) shall be replaced.

M. After cable installation is complete, tested, and, if necessary, repairs made, install all required fire stopping. The Owner Representative or his/her designate will not accept the installation as

completed until all required fire stopping has been installed and accepted as complete. See Section 27 05 33 - Conduits and Backboxes For Communications Systems.

N. Any horizontal cable installed, then removed for any reason, shall not be reused.

3.5 VOICE CROSS-CONNECT CABLE PLACEMENT

A. This cabling system connects 48-port patch panel(s) in each rack to 110 blocks installed adjacent to the voice backbone or riser cable 110 terminations in each TR.

B. One cable shall be used for each jack in the patch panels. Jack counts are based on copper backbone/riser pair counts. Example: A 100-pair copper riser cable would require two (2) 48-port patch panels, a total of ninety-six

(96) jack positions, and four (4) one hundred (100) pair 110 blocks - Reference: 271119-Blocks & Patch Panels.

C. Bundle voice cross-connect cables separately from horizontal WAO cables. Do not mix with horizontal WAO cables.

D. Test cable as for station cabling.

3.6 TERMINATION

A. Comply with Section 27 11 19 - Communications Termination Blocks & Patch Panels and the following:

1. Termination of wiring at the station outlet:

   a. All data and voice station cable shall be terminated at the individual receptacle modules in accordance with EIA/TIA-568-C.
   b. Termination shall not untwist more than 1/2 inch of cable maximum from the manufactured condition.

   c. Service loop at WAO

      1) Copper. Provide slack, which is to be no less than 2.5" and no greater than 5.0", in the station cable at the station outlet end. This is to allow the Work Area Outlet to be removed from the outlet box and visually inspected without leaving so much wire in the box that it might become accidentally damaged during installation.

   d. Termination of wiring at existing station outlets:

      1) Install in data and voice inserts in place of existing blank insert in existing faceplate.
      2) Install new labels and label holders.

2. Termination of copper station wiring at the Telecommunications Room

   a. For the installation/layout of station cable within the Communications Rooms, see detail on drawings.
   b. Install one (1) 48-port patch panel for every 48 WAO cables.
   c. Mount patch panels per the construction drawing set accompanying this Division 27 specification.
   d. Each patch panel shall have a 2RU horizontal manager (WMP) placed both above and below the panel.
   e. Horizontal cables are to be routed neatly on overhead cable runway to equipment racks; exit cable runway into equipment rack vertical

cable management and proceed to the patch panels.

f. Cable termination.

1) Cables on the left side of the patch panel shall enter from the left side vertical cable manager. Cables on the right side of the patch panel shall enter from the right side vertical cable manager. Cables shall not cross the center line of the patch panel.
2) Terminate cables using the 8-pin jack, T568-B four (4) pair termination standard and comply with manufacturer's termination practices, specifications, instructions, and recommendations.

3. Termination of fiber station wiring at the Telecommunications Room

a. Fiber station cabling will similarly be terminated on rack mounted patch panels.
b. Termination shall begin at the upper left corner of the path panel and proceed to the right continuing down, left to right until all cables are terminated.

B. Voice cross-connect system termination.

1. 110 cable end termination.

a. Mount 110 termination fields per manufacturer's specifications, instructions, and recommendations. Use accompanying construction drawing set to determine mounting locations and configurations.
b. 110 C4 blocks shall be used for all but the last position on each twenty-five (25) pair row of a 110 one-hundred (100) pair field and C5 blocks for the last five (5) pair positions in each twenty-five (25) pair row.

2. Patch panel end terminations.

a. Install one (1) 48-port patch panel for every 48 cables terminated at the voice cross-connect systems 110 blocks.
b. Mount patch panels per the construction drawings Each patch panel shall have a 2RU horizontal manager placed both above and below the panel.
c. Terminate cables using the 8-pin jack, T568-B four (4) pair termination standard and comply with manufacturer's termination practices, specifications, instructions, and recommendations.

3.7 LABELING

A. Cable labels are required on the WAO cables only. Voice cross-connect cables do not require cable labels.

B. Label placement: Attach a label to both ends of each cable six inches (6") from the cables termination at WAO and TR patch panel port.

C. Label content and format, both ends of cable shall be XXX - YZZZ where:

1. XXX = the 3-digit building number which is the last 3 digits of the facility asset designator - a 4-digit number called a CAAN number.
2. Y = the floor number - use zero (0) for basement.
3. ZZZ = the WAO jack number the cable is terminated on - 001 through 999.
4. Example: 195-2001 = Building 195, (2) second floor, (001) first jack on the second floor.

D. All labels shall be machine created labels. Hand labeling is not acceptable.

3.8 TESTING, VERIFICATION, ADJUSTMENTS AND ACCEPTANCE

A. Comply with Section 27 10 00 - Structured Cabling, Basic Materials & Methods

3.9 AS-BUILT DRAWINGS

A. Comply with Section 27 05 00 - Common Work Results for Communications.

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SECTION 27 52 25

PORTABLE ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Assistive listening system shall be in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.

B. The work under this section includes all final design, all labor, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete permanent Assistive Listening System (ALS) as indicated on the drawings and as specified herein.

1. Provide portable receivers in quantities as required in the 2019 California Building Code. Quantity of receivers shall accommodate a minimum of 4% of the total number of seats, but no case less than 2.
2. Twenty-five percent minimum of the receivers but no less than 2 shall be hearing-aid compatible neckloops (per CBC Section 11B-706.3)
3. Where the system provided is limited to specific areas or seats, then such areas or seats shall be within 50-foot viewing distance of, and have a complete view of, the stage or playing area (CBC Section 11B-219.4)

C. It is the intent of the Drawings and Specifications, which are presented in a "design-build" format, for the Contractor to design, provide and install a complete, fully operational, and tested system.

D. All miscellaneous system components including, but not limited to, cables, termination equipment, punch blocks, patch panels, backboards, cabinets, power strips, mounts, fasteners, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.

E. The Assistive Listening System shall include, but not be limited to, the following subsystems / products:

1. See Products Section.

1.2 RELATED WORK

A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 27 of these specifications.

B. All applicable portions of Section 26 00 00 shall apply to this section as though written herein completely.

1.3 GENERAL REQUIREMENTS

A. The contractor shall hold a valid State of California C-7 Low-Voltage license, shall have completed at least 5 projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.

B. The contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.

C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented.

D. The installing contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

1.4 QUALITY ASSURANCE

A. In order to maintain a high degree of quality assurance, the Contractor shall, without exception, use the parts and supplies as specified on the drawings and in this specificationor any proposed product substitution or when the Contractor intends to include an “or equal” product in the bid pricing, provide a substitution request submittal to the Owner’s Project Manager for review no later than fifteen (15) calendar days prior to Bid submittal. This report shall include:

1. Description of how the proposed product(s) will impact meeting the project completion date, indicate item(s) with lead times and expected delivery date(s).
2. Itemized cost comparisons between the proposed product(s) and the listedproduct(s).
3. Detailed technical analysis of the electrical and mechanical specification differences between the proposed product(s) and the listed product(s).
4. ETL “Verified” or UL “Verified” test lab documentation for the proposed product(s), component(s) and assemblies.

5. Proposed product identification, manufacturer literature (specifications and cut sheets).
6. Name, address and contact information of several similar projects where the proposed product(s) have been used.
7. Name, address and contact information of the proposed product(s) manufacturer's local representative.
8. Sample proposed product(s) manufacturer's warranty.

B. The Owner's Design Team/Project Manager must approve any proposed product(s) substitution item in writing. The Owner's Design Team/Project Manager reserves the right to require a complete sample of any proposed product(s) and may request a sample tested by an independent testing consultant to prove equality. The decision of the Owner's Design Team/Project Manager regarding equality of proposed product(s) items will be final.

C. It is a mandatory requirement that a single Contractor perform the work described in this specification.

1.5 SUBMITTAL AND MANUAL

A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 26 of these specifications.

B. Additional requirements of this section are:

1. Within fifteen (15) calendar days after the date of award of the Contract, the Contractor shall submit eight (8) copies of the complete submission to the Architect for review.
2. The submission shall consist of five (5) major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
4. The second section shall include a copy of the Contractors valid C-7 California State Contractors license, a list of 5 projects of equal or greater scope, and a list of proposed instrumentation to be used by the contractor. In addition, provide a written notice guarantying the provision of the requested warranty.
5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and datasheets.
6. The fourth section shall contain an original factory data sheet for every component in the specifications.

7. The fifth section shall contain a designation schedule for each Structured Cabling System location and complete 1/8" = 1'-0" scale drawing showing system wiringplans.

C. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.

D. The Contractor shall provide two copies of an "Op-erating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instruc-tions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; awiring

E. destination sche-dule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.

1.6 GENERAL SYSTEM PRODUCT WARRANTY

A. Prior to Owner acceptance, the contractor shall provide to Owner, a manufacturer's product warranty. On behalf of the Owner, the contractor shall submit the required warranty registration form within ninety (90) days of Contractor's purchase. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.

B. The warranty shall commence from the date of final written acceptance by the Owner.

C. All conditions for obtaining the manufacturers warranty shall be the sole responsibility of the contractor.

D. The manufacturer shall warrant the transmitter and receivers to be free from defects in workmanship and material under normal use and conditions for the useful lifetime of the product from date of purchase. Useful lifetime is defined as five (5) years from date of purchase. All other products and accessories shall have a one (1) year limited warranty to be free from defects in workmanship and material under normal use and conditions from date of purchase.

E. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner.

F. A typewritten notice shall be posted at the equipment rack(s) that shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.

PART 2 - SYSTEM EQUIPMENT SPECIFICATION

2.1 ACCEPTABLE MANUFACTURERS

A. All equipment listed herein will be by Listen Technologies; or approved equal.

B. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications and the equipment's technical data sheets.

C. The functions and features specified are vital to the operation of this facility. Therefore, inclusion of a component's manufacturer in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

D. All basic electronic equipment (not including cable) specified herein shall be produced by a single manufacturer of established reputation and experience who shall have produced similar apparatund who shall be able to refer to similar installations rendering satisfactory service.

2.2 SYSTEM FUNCTIONS AND CAPABILITIES:

A. The FM wireless ALS is for use by the hearing-impaired.

B. The ALS system shall be capable of broadcasting on 57 channels and be frequency agile.

C. The ALS shall have 80 db SNR or greater, end-to-end.

D. Portable receivers shall be frequency agile and frequency set with a “seek” button and shall incorporate an LCD display that indicates battery status, RF signal strength and channel.

E. Portable receivers shall incorporate a stereo headset jack that allows the user to plug in either to a mono or stereo headset and listen to the audio normally.

F. Portable receivers shall incorporate automatic battery charging circuitry for the recharging of NiMH batteries.

G. Audio signal inputs shall consist of 3.5mm jacks, located in wall or floor boxes as indicated on the plan drawings.

2.3 PRODUCTS:

A. The following is to be used as a GUIDE, and are to be included, but not limited to, in the system(s) to be supplied.

2.4 LISTEN TECHNOLOGIES LT-700 PORTABLE FM TRANSMITTER

A. The portable FM transmitter shall be capable of broadcasting on 57 channels. The unit shall incorporate a microphone sensitivity switch. The device shall broadcast on both wide and narrow band channels with a SNR of 80dB or greater. The device shall have an audio frequency response of 50Hz to 15KHz (± 3dB) at 72MHz, or of 50Hz to 10KHz, (± 3dB) at 216MHz. The device will incorporate a mute switch and the battery door shall be capable of being mechanically locked. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, and RF signal strength. The portable transmitter shall incorporate automatic battery charging circuitry for the recharging of NiMH batteries, with the ability to charge via a wall transformer or drop in charging case. Each portable transmitter shall come equipped with its own patch cable allowing them to easily interface with the input of a stationary sound system anywhere on campus. Include one (1) line input cable with each portable transmitter. Listen Technologies part number LT-700-072, LT-700-216.

B. PROVIDE QUANTITY REQUIRED PER 2014 CBC 11B ALS REQUIREMENTS.

2.5 LISTEN TECHNOLOGIES LR-4200 PORTABLE RECEIVER

A. The FM receiver shall be capable of receiving on 57 wide and narrow band channels. The receiver shall tune to a single channel and user shall not be able to change the channel. The receiver shall have a signal-to-noise (SNR) ratio of 80 dB or greater (70dB for the 216MHz models) and shall have an audio frequency response of 50 Hz - 15 kHz (±3 dB). The receiver shall employ a unique DSP SQTM noise reduction technology. The receiver shall have a programmable squelch circuit. The receiver shall incorporate a multi-functional display (OLED) that indicates battery status, inventory number, volume level and customizable channel names. The receiver shall have the option of being lanyard or belt clip worn and the lanyard shall incorporate an integrated neck loop for compatibility with T-coil hearing aids. The receiver shall be intelligent and provide customized audio to either earphones or the integrated neck loop based upon which is connected. The receiver shall have two (2) 3.5 mm (TRRS) connectors to drive the integrated neck loop lanyard or up to two (2) mono or stereo earphones. The receiver shall be fully programmable via supplied software. The receiver shall have a micro USB connector used for programming/setup, inventory control, charging, and firmware upgrades. The receiver shall incorporate automatic battery charging circuitry and use a non-proprietary lithium ion (Li-ion) battery. The receiver shall automatically turn on when removed from the charging device and automatically turn off when returned to the charging device. The receiver shall have additional charging contacts to allow multiply charging options. The receiver shall be covered by a hassle free limited lifetime warranty. Listen Technology part numbers

B. LT-4200-072, LT-4200-216.

C. PROVIDE QUANTITY REQUIRED PER 2014 CBC 11B ALS REQUIREMENTS.

D. Listen Technologies LA-166 Neck Loop, for wireless connection to hearing aids equipped with a “T” coil. Provide quantity of 25% of total quantity of receivers.

E. Listen Technologies LA-164 Ear Speaker, over-the-ear design, single ear clip. Provide quantity 1 per reciever.

F. Listen Technologies LA-311-01, 16-Unit Charging/Carrying case. Case shall have drop-in charging stations for simultaneous charging of up to 16 portable receivers. Case shall have auto shut-off feature to prevent over-charging receivers. Case shall be hard-sided and lockable. Provide quantity required.

G. Listen Technologies LA-362 NiMH rechargeable batteries, (2) required per portable device.

H. Listen Technologies LA-304 Notification signage kit(s), or as directed by Architect. See Architect drawings for quantity.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should anyvariations in these requirements occur, the contractor shall notify the architect before making any change. It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Furnish all conduit, junction boxes, conductors, cables, faceplates, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

C. The cables within the rack or cabinets shall be carefully wrapped and strapped with Velcro tie straps. Nylon type “zip ties” or tie-raps are prohibited. All cables shall be numbered for identification at both ends. Cable numbering shall be provided on final as-built drawings.

D. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

E. The system must meet all local and other prevailing codes.

F. The system must meet all 2014 CBC code section 11B-706 Assistive Listening Systems requirements.

G. The system shall accommodate a minimum of 4 percent of the total number of seats in the required area.

H. Contractor shall provide Assistive Listening System signage in the quantities and locations as indicated on the architectural drawings, and as required by 2014 CBC and the 2010 ADA Standards.

I. Prior to ordering equipment, Contractor shall perform a radio frequency (RF) test to determine and identify any potential RF interference. Contractor shall be responsible to select ALS system radio frequencies that do not receive RF interference from other building systems such as lighting, power, generators, HVAC, computers, audio paging, etc. Final system testing shall be conducted with all building systems turned on to verify the ALS system is free of interference. If RF interference is detected within the first 30 days after project completion, contractor shall replace ALS equipment with equipment on another frequency at no additional cost to the owner. Contractor shall include all costs in base bid.

J. All cabling shall be splice free.

K. Plenum rated cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cables shall not be laid directly on the ceiling panels. The use of cable ties shall be done in accordance with the cable manufacturer's requirements. The cable jacket composition must meet local and all other prevailing fire and safety codes.

L. All firewalls penetrated by structured cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the California Electric Code (CEC) or other prevailing code.

M. The contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.

N. Submit block diagram and as-built drawing of all equipment.

O. 120 volt AC to be supplied by the Electrical Contractor.

3.2 GENERAL TESTING REQUIREMENTS

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds.

3.3 FINAL ACCEPTANCE

A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.

B. The Owner or Owner's representative will conduct a final job review once the contractor has finished the job. This review will take place within one week after the contractor notifies the owner.

C. Two copies of all certification data and drawings for all identifications shall be provided to the Owner before the owner's review.

D. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.

E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the contractor.

F. In the event that repairs or adjustments are necessary, the contractor shall make these repairs at his own expense. All repairs shall be completed within 10 days from the time they are discovered.

G. The contractor shall provide not less than eight (8) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.

H. The contractor shall hand to the owner a copy of any applicable installation specific software configurations in compact disk or USB thumb drive format.

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DIVISION 28

ELECTRONIC SAFETY AND SECURITY

SECTION 28 10 00

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Equipment furnished under this sections shall be a complete electronic access control system to include but not limited the following elements:

1. Controller

    a. System software
    b. Reader interface
    c. Power supplies
    d. Card readers and credentials
    e. Wiring, switches, and ancillary equipment

B. Related Requirements

1. Section 08 71 00 - Door Hardware

C. REFERENCES

1. Abbreviations

    a. ACS: Access Control System
    b. API: Application Programming Interface
    c. DHCP: Dynamic Host Configuration Protocol
    d. IP: Internet Protocol
    e. LAN: Local Area Network
    f. NVR: Network Video Recorder
    g. ODBC: Open Database Connectivity
    h. RAM: Random Access Memory
    i. SP/DT - Single pole, double throw
    j. SSL: Secure Sockets Layer
    k. TCP: Transport Control Protocol
    l. UPS: Uninterruptible Power Supply
    m. VMS: Video Management System

2. Definitions

    a. ABA Track: Magnetic stripe that is encoded on track 2, at

75-bpi density in binary-coded decimal format.

b. Proximity Readers and Credentials: Readers and cards employing 125 KHz communication to validate when the card is presented within the proximity of the card reader.
c. Smart Card Readers and Contactless credentials: Readers and cards employing
13.56 MHz encrypted communication to validate when the card is presented within the proximity of the card reader.
d. Credential: Data assigned to an entity and used to identify that entity.
e. Trigger: Enables an action or a series of actions that are sent across any or all controllers, readers, contacts or relays throughout the system. Triggers can be used to send commands to change the state of a door, multiple doors, contact states, relay states, shunt points, lockdowns or to activate predetermined overrides.
f. Pass-Through: The ability assigned to a person's credential that allows them to access a door even if in lockdown state.
g. Lockdown: An input or a credential that allows the system to be placed into a lockdown state.
h. Wiegand: Patented magnetic principle that originally used specially treated wires embedded in the credential card. Today Wiegand has become the communication standard for most reader heads.

3. Reference Standards

a. Underwriters Laboratories - UL 294 - Standard for Access Control System Units
b. ISO/IEC 14443-3:2011 - Identification Cards
c. ADA - Americans with Disabilities Act
d. National Fire Protection Association
e. NFPA 70 National Electric Code
f. NFPA 101 - Life Safety Code
g. NFPA 731 - Standard for the Installation of Electronic Premises Security Systems
h. Institute of Electrical and Electronic Engineers
i. IEEE 802.3 Ethernet Standards

4. SUBMITTALS

a. Informational Submittals

1) Product Data
2) Manufacturer product data sheets
3) Performance data, ratings, and other descriptive data necessary to describe the item proposed and its operating characteristics. Include dimension, wiring and block diagrams, and a complete

technical specification for the submitted equipment, noting differences and adherence to all Division 28 sections.

4) Manufacturer product instructions, and installation and operating manuals
5) Shop Drawings

    a) Complete set of proposed drawings, identifying equipment locations, types of cabling, numbers of conductors, raceway locations, and termination points of each conductor.
    b) Complete listing of proposed devices, indicating interconnection equipment locations and specifying terminal/connecter termination locations.
    c) Operational narrative of each component/system.
    d) Qualification Data: Letters of certification for each supplier.

6) Closeout Submittals

    a) Warranty Documentation:

        (1) Manufacturer warranty statements for all system components and applicable equipment.
        (2) Statement of labor warranty from the manufacturer, Security Contractor, and/or 3rd party entity.

7) Record Documentation:

    a) Copy of a signed agreement between the Security Contractor and the Owner stipulation that the license of all software and operation systems become the sole property of the Owner.
    b) Listing of all passwords used to access all aspects of the operating system software and database utilized by the system. Include the name and position of anyone who has knowledge or record of these passwords.

8) Maintenance Material Submissions:

    a) Listing of spare parts required to maintain the system.
    b) Listing of any specialized tools required by the End User in order to perform routine maintenance.

9) Closeout Submittals

    a) Final listing of doors, locations, and normal status in MS Excel format.
    b) Complete set of supplier’s operating instructions,

installation instructions, and troubleshooting guide, to include but not be limited to instructions for:

(1) Setting up personnel, time zones, doors and holidays
(2) Assigning access permissions to personnel
(3) Monitoring system activity
(4) Running standard reports
(5) Setting up login permissions

c) Schematic drawings depicting type and location of interface equipment/components, number of cables and conductors, raceway locations, types of connectors, circuit requirements and type and dimensions of enclosures.

10) Commissioning Reports: Final Test Acceptance and Start Up Testing

D. QUALITY ASSURANCE

1. Requirements of Regulatory Agencies:

a. Furnish security equipment to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
b. Furnish security equipment to comply with the requirements of American National Standards for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People (ICC/ANSI A117.1), the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.

2. Contractor qualifications:

a. Company with system design, engineering supervision, and installation experience in the access control industry.
b. The Contractor shall maintain a fully staffed local office, with a service center staffed by trained technicians and must be adequately equipped to provide emergency phone service within twenty-four (24) hours on a twenty-four (24) hour, 365 days per year basis, whether or not the owner purchases a maintenance contract with the Contractor.
c. The contractor shall maintain an inventory of spare parts and other items critical to system operation, as necessary to meet the emergency service requirements.
d. The Contractor shall have in-house engineering and project management capability consistent with the requirements of this

project.

e. The contractor shall provide a project manager who is actively in the project. This person shall be the same individual throughout the course of the project and shall be the person responsible for the scheduling of the system programming, preparation of the Operation and Maintenance Manuals, Training Programs, documentation and system testing, maintenance of Drawings and the coordination of all subcontract labor.
f. The Owner reserves the right to approve the contractor's Project Manager.
g. The contractor must abide by and adhere to all Drug Free School Zone laws and participate in a drug-free workplace program.

3. Testing Agency: Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Acceptance: Upon delivery to the site, Contractor shall inspect all products and materials for any damage. Acceptance of the units constitutes that the inspection has occurred and no damaged or unacceptable products were found, and any damage or unacceptable products would be the responsibility of the Contractor.
2. Product Hardware Storage and Handling Requirements

   a. Store in temperature and humidity controlled environment in original manufacturer's sealed containers per Manufacturer instructions.
   b. Open each container; verify contents against packing list, and file copy of packing list, complete with container identification for inclusion in operation and maintenance data.
   c. Save original manufacturer's containers and packing materials and deliver until directed otherwise by Owner.

F. PROJECT CONDITIONS

1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

G. COORDINATION

1. Coordinate work of this Section with other directly affected Sections:
2. Conduit and raceways as needed for data and electrical hardware items.
3. Fire/life-safety system tie-in (interfacing).

4. Distribute point-to-point wiring diagrams plus riser diagrams to related trades.

H. WARRANTY

1. All work and system components shall be covered by a one- (1) year warranty against defects in materials and workmanship, commencing with substantial completion of the project, unless otherwise directed by the owner or their representatives
2. During system warranty period, system updates shall be made available to owner at no additional cost to the owner.
3. During warranty period, provide twenty-four (24) hour toll-free technical support.

I. LICENSING

1. Access control software shall be available with up to 9999 client licenses.
2. Vanderbilt SMS software is available with 1, 2, 3, 4, 5, 10, 25 & greater client licenses. MS SQL Express is included up to 5 client licenses. Above 5 clients users Microsoft SQL which is not included

1.2 PRODUCTS

A. MANUFACTURERS

1. Vanderbilt Industries

a. 2 Cranberry Rd., Parsippany, NJ 07054
b. Products

1) Access control software: VSMS-SFT
2) Video Management Software: VVMSNG
3) Redundant Recovery Solution VRR
4) Guest pass software: VGUEST-LIC
5) 3rd Party integrations: VI-Connect
6) Enrollment reader: VENROLL
7) Quick Deploy Mobile Wireless Sys VI-MWK & VI-MWK-2
8) Reader controllers:

a) 2 Door: VSRC-M
b) 16 door: VRCNX-R
c) RS-485 interfaces:

(1) Reader interface: VRINX
(2) Single Reader Interface VRI-1
(3) Dual Reader Interface VRI-2

(4) Universal Reader Interface VURI
(5) Input/output interface: VIONX-8
(6) 16 Zone Input Monitor Module VI-16IN
(7) 16 Relay Output Module VI-16O
(8) Wireless to AD400 series locks: PIM400-485-SMS
(9) Wireless to NDE series locks: NDE Gateway

d) TC/IP interfaces:
e) Custom Enclosures (Pre-wired) VRCNX-ENCL & VRINX-ENCL
f) Network Video Recorders VVMSNG-4, 8, 16, 32 & 48 (analog & IP)
g) Power supplies: SMS-3APSD, SMS-6APSD, SMS-10APSD
h) Readers (Vanderbilt):125 kHz, VP-300, VP-500, VP-640
i) Readers (Vanderbilt): Magnetic stripe MR5, MR10 & MR20
j) Readers (Vanderbilt): Barcode BSRW
k) Readers (Allegion): 125 kHz, 13.56 MHz, NFC & Magnetic stripe: ALL
l) Credentials (Vanderbilt) 125kHz VPSC-1, VPSM-2P, VPSK-3, VPDT-1
m) Credentials (Vanderbilt) Magnetic stripe MSH
n) Credentials (Allegion) 125 kHz, 13.56 MHz, NFC

2. Allegion
   a. Products
      1) Credentials and readers: aptiQ 125 kHz & 13.56 MHz
      2) Networked electronic locks: Schlage AD-300, AD-400, NDE, LE
      3) Off-line locks: Schlage AD-200, AD-250, CO-200. CO-220
      4) RS-485 panel interface: Schlage PIM400-485
      5) RS-485 panel interface: Schlage NDE Gateway
      6) Remote Key Switches & Request-to-Exit Buttons: Schlage brand
      7) Request-to-exit motion sensors: Schlage brand
      8) Electric horns, door alarms, and strobes: Schlage brand

3. Others

    a. Products

        1) Network server
        2) Surge protection components
        3) Back-up UPS power
        4) Card and badge printers

B. SYSTEM DESCRIPTION

1. The access control system shall:

    a. Regulate access through specific portals to secured areas.
    b. Utilize card technology, keypad and/or biometric as its primary access devices.
2. Access control system functions shall be determined by the functionality and configuration of the access control system software.
3. The access control system shall support integration of all additional hardware and software components offered by the same Manufacturer.
4. The access control system software shall be accessible from any PC with a web browser, and with network IP access to the access control server.
5. The access control system shall be programmable via web browser for certain access control functions, as determined by the system administrator.
6. The access control system shall be capable of electronic downloads and firmware updates.

C. SYSTEM ARCHITECTURE:

1. The access control system shall consist of the following components:

    a. System software resident on a network server (“access control server”)
    b. Reader controllers
    c. Reader interfaces
    d. Input / Output expansion boards
    e. Network and wireless locks
    f. Off-line locks
    g. Key switches
    h. Request-to-exit buttons and motion sensors
    i. Card readers
    j. Credentials (cards)
    k. Power Supplies and Backup Power

2. Operation

    a. The access control system's functions shall be determined by the configuration of the system software.
    b. The access control server shall communicate over an IP network to door controllers, and readers and locks.
    c. Door controllers shall communicate downstream to non-IP devices over an RS-485 2-wire network.

D. SYSTEM SOFTWARE

1. The system software shall be provisioned on a server whose capability meets the requirements of the Manufacturer.
2. The system software shall be accessible from any authorized computer with network access via a web browser or SMS thick client.
3. The web browser shall allow a user to access, monitor and manage the access control system.
4. System Management: The software shall allow the user to simultaneously monitor and maintain a secure working environment.

    a. The software shall provide the following functions:

        1) Transaction & alarm management, monitoring, and routing

            a) Color coded alarms
            b) User-definable individual alarm instructions
            c) Pre-defined responses
            d) Send alarms to operator, group of operators, PC or email
            e) Keypad duress alarm
            f) Alarm annunciation
            g) Alarm graphics
            h) Anti-pass back
            i) Web Client for operators
            j) Card activation and expiration dates and times
            k) Lockdown ability system wide by reader or by an input
            l) Universal Triggers-enables an action in response to an input
            m) Two-man rule and occupancy rule
            n) First card in capability
            o) Cardholder management, including user defined fields & special access needs
            p) Management of online and off line locks/readers
            q) Portrait capture and card production
            r) Portrait monitor - ability to view photo on card read
            s) Temporary badge and badge creation

t) Guest pass management for visitors
u) Elevator control
v) Report Scheduler
w) Audit Trail and reporting
x) Manual and automatic overrides
y) Automatic scheduling of predefined reports
z) Electronic software key licensing

2) At no additional cost the software shall have no limitations on the number of:

a) Card holders
b) Card readers
c) Alarms handled
d) Operators
e) Time zones
f) Number of reports

3) The system shall be capable of interfacing with an enrollment reader.
4) Video:

a) The software shall have the capability to interface with the Manufacturer’s own video software and video management system with the following features
b) VMS features:

(1) Full integration with Manufacturer's DVR/NVR
(2) High resolution video motion detection with masking capabilities
(3) Search on video motion detection
(4) Uninterrupted recording during playback and image archiving
(5) Remote viewing
(6) Send video clips via email
(7) Customizable pre and post-recording upon an event
(8) Video Export Watermarking
(9) Proprietary viewer software for viewing exported video files
(10) Scalable
(11) 100% date/time synchronization
(12) Full PTZ functionality
(13) Virtual camera grouping across servers
(14) Advanced security permissions
(15) Database backup and recovery

(16) Audio per camera available
(17) Active directory integration
(18) Megapixel Resolution Support
(19) HD Camera Support
(20) MJPEG, MPEG4, H.264
(21) Configuration wizards
(22) Ease of navigation
(23) Customizable views per operator
(24) Camera Mapping feature with activity indicators
(25) Multi-Playback functionality
(26) Thumbnail Playback functionality
(27) Administrative and Health Monitoring tools
(28) Web Client with HTTPS support
(29) Mobile application with HTTPS support
(30) Play video associated with an SMS transaction
(31) Use PTZ controls and preset positions from within SMS Live View
(32) Transactions in SMS can automatically send a PTZ camera to a preset position
(33) Export video clips directly from SMS
(34) View live and recorded video associated with alarm transactions
(35) NVR & Camera status monitoring in SMS Alarm Monitor

c) The software shall integrate with third party video management systems as required,
d) Consult Vanderbilt for compatible third party VMS products.

5) Third party integrations: The software shall support third party function integrations through ODBC-based API's, VI Connect and Vanderbilt advanced importer
6) The system shall have the ability to push and pull information to multiple 3rd party databases to automate the management of the system

5. Server Requirements

a. Acceptable operating system:

1) Microsoft Windows 7 SP1 or later
2) Microsoft Windows 8 Professional
3) Microsoft Windows 8.1 Professional
4) Microsoft Windows 10
5) Microsoft Windows 2008 Standard or Enterprise SP2 or later
6) Microsoft Windows 2008 R2 Standard or Enterprise SP1 or later
7) Microsoft Windows 2012 Essentials, Standard or Datacenter

8) Microsoft Windows 2012 R2 Essentials, Standard or Datacenter
9) Acceptable database software:
   a) Microsoft SQL Server 2005 Standard or Enterprise SP4 or newer
   b) Microsoft SQL Server 2008 Standard or Enterprise SP2 or newer
   c) Microsoft SQL Server 2008 R2 Standard or Enterprise SP1 or newer
   d) Microsoft SQL Server 2012 Standard or Enterprise SP2 or newer
   e) Microsoft SQL Server 2014 Standard / Enterprise SP1 or above
10) Network interface: 10/100 Ethernet
11) DVD/CDRW
12) 22-inch flat screen monitor
13) 104-key keyboard

6. User workstation requirements
   a. No dedicated PC shall be required.
   b. The system shall require no client or server software installation when running web client
   c. Browsers supported: Internet Explorer, Firefox, Apple Safari, Google Chrome
   d. Additional software required: As needed to run and export standard reports as .csv files

E. SYSTEM HARDWARE

1. Reader Controller VRCNX-M

   a. The reader controllers shall be independently programmed, intelligent devices, capable of making decisions and storing transactions at the local level and compatible with Manufacturer's software.
   b. The system shall provide reader controllers to accommodate communications to:

      1) One reader up to
      2) 16 readers
      3) 16 hard-wired all in one locks
      4) 16 wireless all in one locks
      5) Controllers shall be field configurable with standard system software.
      6) Reader controllers shall have flashable firmware.
      7) Operating system: Linux

8) Memory

a) SDRAM: 128 MB
b) NAND Flash: 256 MB

9) Communication:

a) Upstream: Ethernet via TCP/IP
b) Downstream:

(1) Serial: RS-485 2 wire
(2) Clock/data
(3) Wiegand

10) Power:

a) Voltage: 12 - 24 VDC (local UL294 rated power supply)
b) Current: 500mA (excluding peripheral devices)

11) Listing: UL294
12) Physical:

a) Board: 11 ¾” H x 13” W x 2 ¼”D
b) Enclosure: 17” H x 17” W x 2-3/4” D NEMA rated lockable and tamper-proof

13) Operating temperature: 0° to 49° C (32° to 120° F)
14) Operating relative humidity: 10 - 90% non-condensing

2. Reader Controller VSRC-M

a. The reader controllers shall be independently programmed, intelligent devices, capable of making decisions and storing transactions at the local level and compatible with Manufacturer's software.
b. The system shall provide reader controllers to accommodate communications to:

1) One reader up to
2) 8 readers
3) 8 hard-wired all in one locks
4) 8 wireless all in one locks
5) Controllers shall be field configurable with standard system software.
6) Reader controllers shall have flash able firmware.
7) Operating system: Linux

8) Input/output

a) Inputs: 8 supervised or non-supervised
b) Outputs: 4 form “C” SP/DT 5A relays

9) Memory

a) SDRAM: 128 MB
b) NAND Flash: 256 MB

10) Communication:

a) Upstream: Ethernet via TCP/IP
b) Downstream:

(1) Serial: RS-485 2 wire
(2) Clock/data
(3) Wiegand

11) Power:

a) Voltage: 12 - 24 VDC (local UL294 rated power supply)
b) Current: 500mA (excluding peripheral devices)

12) Listing: UL294
13) Enclosure:

a) Lockable and tamper-proof
b) NEMA rated

14) Operating temperature: 0° to 49° C (32° to 120° F)
15) Operating relative humidity: 10 - 90% non-condensing

3. Reader Interface VRINX -Each Wiegand output reader in the system shall have a dedicated reader interface panel able to connect to the controller via RS-485 protocol.

a. The Reader Interface shall support multiple reader technologies including, but not limited to:

1) Smart Card
2) Magnetic Stripe (swipe or insertion)
3) Wiegand (swipe or insertion)
4) Proximity
5) Biometric
6) Barcode

7) Input/output

a) Inputs: 4 supervised or non-supervised
b) Outputs: 2 form “C” SP/DT 1A relays

8) RS-485 communication: 2-wire, up to 4,000 feet

9) Power:

a) Voltage: 14 - 24 VDC - predicated upon read head used
b) Current: 120 mA @ 24 VDC (without read heads)

10) Operating temperature: 0° to 49° C (32° to 120° F)
11) Operating relative humidity: 10 - 90% non-condensing

4. Reader interfaces VRI-1 -Each Wiegand reader in the system shall have a dedicated reader interface panel able to connect to the controller via RS-485 protocol.

a. The Reader Interface shall support multiple reader technologies including, but not limited to:

1) Smart Card
2) Magnetic Stripe (swipe or insertion)
3) Wiegand (swipe or insertion)
4) Proximity
5) Biometric
6) Barcode
7) Input/output

a) Inputs: 2 supervised or non-supervised
b) Outputs: 2 form “C” SP/DT (1) 5A & (1) 1A relays

8) RS-485 communication: 2-wire, up to 4,000 feet
9) Power:

a) Voltage: 12 VDC
b) Current: 110 mA @ 12 VDC (without read heads)

10) Operating temperature: 0° to 49° C (32° to 120° F)
11) Operating relative humidity: 10 - 90% non-condensing

5. Reader interfaces VRI-2 Dual reader interface - the system shall have a dedicated reader interface panel able to connect to the controller which will support two reader heads via RS-485 protocol.

a. The Reader Interface shall support multiple reader technologies including, but not limited to:

1) Smart Card
2) Magnetic Stripe (swipe or insertion)
3) Wiegand (swipe or insertion)
4) Proximity
5) Biometric
6) Barcode
7) Input/output

    a) Inputs: 8 supervised or non-supervised
    b) Outputs: 6 form “C” SP/DT 5A relays

8) RS-485 communication: 2-wire, up to 4,000 feet
9) Power:

    a) Voltage: 12-24 VDC
    b) Current: 120 mA @ 24 VDC (without read heads)

10) Operating temperature: 0° to 49° C (32° to 120° F)
11) Operating relative humidity: 10 - 90% non-condensing

6. Universal Reader Interface- is custom designed to share one reader with up to three access control systems. The VURI is the Perfect solution for multi-tenant buildings with multiple access control systems sending only the appropriate card information to the appropriate access control system
7. Output expansion VIONX-8

    a. If required, an expansion board shall have eight SP/DT relay outputs and communicate directly to a reader controller.
    b. Memory

        1) RAM: 1 KB
        2) Flash: 16 KB
        3) Serial communications: RS-485 or RS-232

8. Output expansion V16O

    a. If required, an expansion board shall have sixteen SP/DT relay outputs and communicate directly to a reader controller.
    b. Memory

        1) RAM: 1 KB
        2) Flash: 16 KB
        3) Serial communications: RS-485 or RS-232

9. Input expansion V16In

    a. If required, an expansion board shall have sixteen SP/DT relay outputs and communicate directly to a reader controller.
    b. Memory

        1) RAM: 1 KB
        2) Flash: 16 KB
        3) Serial communications: RS-485 or RS-232

10. Readers - Insert specifications on acceptable readers to support requirements shown below

    a. Multi-Technology and Proximity:

        1) Available in wall mount, mullion mount, and with or without keypad.
        2) 125 kHz prox. and/or 13.56 MHz contactless readers compatible with all ISO 15693 and ISC 14443 standards.
        3) LED red/green visual indicator with audio feedback.
        4) Constructed of PBT polymer in charcoal and black colors.
        5) Off-line & on-line intelligent all in one locks
        6) Magnetic Stripe
        7) Barcode

11. Credentials

    a. Multi-Tech/Proximity Credentials: Mobile/Bluetooth credentials 125 kHz prox. and / or
    13.56 MHz contactless credentials compatible with all ISO 14443 standards.
    b. Smart Card credentials: 13.56 MHz contactless credentials compatible with all ISO 14443 standards.

12. Locks

    a. Networked locks shall communicate to the reader controller via RS-485.

        1) Hard wired locks shall:

            a) Communicate over a hard-wired RS-485 network
            b) Support daisy chain or star configuration
            c) Have built in request-to-exit, door position, lock/unlock status, request-to-enter, interior cover tamper guard, and deadbolt position properties

d) Have addressable lockdown, unlock capability
e) Be field configurable
f) Wireless locks shall:

(1) Communicate to the reader controller through a wireless-RS-485 converter
(2) Devices per converter: up to 16
(3) Employ encrypted 900 MHz transmission
(4) Nominal distance with normal building obstructions: 200 feet
(5) Clear line of sight distance; 1000 feet
(6) Verify credential in less than one second
(7) Have a 2-year battery life

g) Off-line locks shall:

(1) Be programmable via hand-held device
(2) Support proximity, smart card, and magnetic stripe card technology
(3) Have a 2-year battery life

13. Power Supplies and Back-up Power

a. Input: 85 - 260 VAC with On/Off service switch

1) No switch over or voltage drop on input power failure with fully charged batteries
2) 2) Output: <1.5 A @ 24 VDC / 3 A @ 12 VDC> <6 A @ 24 VDC / 6 A @ 12
3) VDC> <20 A @ 12 VDC; 10 A @ 24 VDC / 20A @ 12 VDC>

a) The above power outputs apply to SMS-3APSD, SMS-6APSD, SMS-10APSD, respectively.

4) Back-up Batteries: Two (2) 12 VDC 7 AH to provide 4 hours of back-up
5) Indicator LED - Indicates AC operating status of the unit
6) Protection:

(a) Electronic power limited short circuit protection
(b) Thermal regulator for preventing overheating

7) Environmental:

(a) Ambient Temperature: -4º to 95º F in Enclosure (-20º to 35º C)
(b) Relative Humidity: 95% Non-Condensing

8) Approvals: UL 294 listed
9) Contractor shall provide any special power treatment required, such as filtering or spike elimination that may be required for proper operation and protection of the access control system.

14. Custom Enclosure (Factory Pre-wired & Tested) VRCNX-ENCL

    a. Input: 85 - 260 VAC with On/Off service switch
    b. Back-up Batteries: Four (4) 12 VDC 7 AH to provide 4 hours of back-up
    c. Terminal blocks for landing all field wiring
    d. NEMA 1 rated enclosure 31" x 31" x 8" with removable sub-panel
    e. Enclosure houses: (1) VRCNX-M Reader Controller; up to (8) VRINX Reader Interfaces - factory installed; all panels are sold separately Note: This unit can be used in conjunction with the VRINX enclosure (VRINX-ENCL) to expand reader capacity from 8 to 16 VRINX Reader Interfaces (sold separately).

1.3 EXECUTION

A. SITE VERIFICATION OF CONDITIONS:

1. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
2. Examine roughing-in for LAN and control cable conduit systems to Server, PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. PREPARATION

1. Pre-Installation Conference: Prior to installation arrange conference between supplier, Owner, and related trades to review materials, procedures, and coordinating related work.
2. Furnish or coordinate any inserts required for building into concrete, masonry, and other work, to support and attach work of this section. Furnish or coordinate in ample time to comply with schedule of work into which inserts are built.
3. Verify that power and outlets are in correct locations.
4. Verify that building structure is properly prepared for mounting, attachment and support of equipment.
5. Prior to installation of systems components and devices, verify all

required preparations have been properly performed and that substrates are acceptable for installation.

a. Verify all rough-ins and field dimensions.

6. Report in writing to the Architect or owner's representative, any prevailing conditions that will adversely affect satisfactory execution of Work in this Section.

   a. Owner or their representative reserves the right to review proposed methods of construction/installation, reject proposed methods, and have the installation done in a satisfactory method at the Contractor's cost.

C. HARDWARE INSTALLATION

1. Sequencing: The work shall be performed in the following sequence, unless directed otherwise by Owner or their representative:

   a. Installation of wiring, Controllers & power supplies.
   b. Installation of new field devices & new readers.
   c. Installation of front-end equipment.
   d. Commissioning of the new system components.
   e. End User training
2. Install work in accordance with manufacturer's recommen-dations, instructions and final Shop Drawings. All control panels and power supplies should be installed so as to allow easy access for service in the future.
3. Anchor components securely in place, plumb, level, and accurately aligned.
4. For card readers located in equipment traffic areas, and that are exposed to damage due to collision or impact from forklifts, or manually moved carts, carriers, or other equipment

   used by the Owner, provide protective bollards, railings, coverings etc. to ensure that all card readers installed are properly protected from such damage.
5. Provide fastenings, plates, and other incidental items required for complete and operational installation.
6. Provide required electrical work in accordance with code requirements.

7. Security and Protection

   a. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured during periods when a qualified operator in the employ of Contractor is

not present.

b. Equipment protection: Provide protective covers, fenders, and barriers as necessary to maintain Work of this Section in same condition as installed until time of Substantial Completion.

8. Create and deliver final as built Shop Drawings.

9. Cable Requirements

   a. Twisted, shielded, plenum-rated type cable shall be used.
   b. All exposed wiring shall be in ridged conduit and wire mold.
   c. All cables shall be fastened to the structure at least every 10 feet, or whatever local code dictates, where not in conduit.

D. PROGRAMMING AND SOFTWARE INSTALLATION

1. Complete all database entry (unless otherwise noted)

   a. Personal/Staff information
   b. Access times for all personal/staff.
   c. Definitions of openings for staff access.
   d. Holiday definitions.
   e. Special access privileges.
   f. Lock down conditions.

2. Develop, install, and test software and databases for the complete and proper operation of systems involved.
3. Assign secured IP address to / or supplied by Owner.
4. The Contractor shall coordinate with the Owner to ensure that new components will be properly programmed into the system.

E. SITE QUALITY CONTROL

1. The Contractor shall develop a Final Test and Acceptance (FTA) Plan to identify each new system component provided intent of test, method or methods of test and expected results.
2. Each component listed in the plan shall include space for test part signatures, brief comments, time of test and pass/fail check boxes.
3. The FTA plan shall be submitted to the owner's representative 30 days prior to the scheduled final test.
4. Start-up Test
   a. Final system acceptance of the access control system shall be conditioned upon successful completion and operational demonstration of all system functions and components.

F. SYSTEM ACCEPTANCE: System acceptance shall not occur until after the following activities have been successfully completed:

1. Acceptance of all submittals
2. Delivery of final documentation
3. Successful Final Test and Inspection
4. Successful Operational Demonstration Test
5. Successful training and demonstration, including operation of systems using the manuals
6. Purging of Contractor User privileges and return of all key card media

G. OWNER PERSONNEL TRAINING

1. On Site Operator training: instruct operating staff in proper operation, including hands-on training.

    a. Minimum of two (2), four (4) man-hours covering the operations for each system installed.
    b. Training sessions shall be provided to supervisors, staff utilizing systems and equipment provided under this section, maintenance personnel and any other personnel designated by the owner. Security Contractor should prepare to provide operator training for up to seven (7) personnel.
    c. Security contractor shall be prepared to provide training sessions on all work shifts, including day, evening and night shifts.

2. On Site Administrator training: instruct owner-designated security system administrators for each system installed.

    a. Minimum of one (1), twenty-four (24) man-hours of training for each owner-designated individual.
    b. Training to cover all administrative and management functions, features and controls for each system.

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SECTION 28 20 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

D. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 27 1000 - Structured Cabling: Data cables for IP video surveillance system network connections.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 303 - Standard for Installing Closed-Circuit Television (CCTV) Systems; 2005.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.

1.5 SUBMITTALS

A. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Design Data:

1. Standby battery/UPS calculations.
2. Video storage capacity calculations.

D. Certify that proposed system design and components meet or exceed specified requirements.

E. Evidence of qualifications for installer.

F. Field quality control test reports.

G. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract

maintenance and trouble call-back service.

I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

J. Software: One copy of software not resident in read-only memory.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.

2. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications: Company specializing in performing the work of this section with experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

D. Provide service renewable service contract with Owner to clean, maintain, and repair camera system as needed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Contractor shall provide minimum five year warranty and service period. At completion of the service period, provide an option for the Owner to extend the service contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Video Recording and Viewing Equipment - Basis of Design: Axis Communications.

B. Cameras - Basis of Design: Axis Communications.

2.2 VIDEO SURVEILLANCE SYSTEM

A. Provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

2.3 VIDEO RECORDING AND VIEWING EQUIPMENT

A. Provide video recording and viewing equipment compatible with cameras to be connected.

B. Network Video Recorders (NVRs):

1. Supports connection of network (IP) cameras.
2. Supports continuous and event-based recording (Maximum 14 days).
3. Network Video Recorder Type S1148:
    a. Capacity: 64 channels.
    b. Storage Capacity: 24 TB Minimum
    c. Network: Single 1 Gigabit Ethernet.

d. Features:

1) Compression: H.265, H.264, MJPEG, WiseStream for H.265 AND H.264

2) Resolution range: 352x288 (CIF) up to 4000x3000 (12MP).

3) Supports remote access via desktop and mobile device.

e. Rack mountable.

C. Software:

1. Unless otherwise indicated, provide all software and licenses required for fully operational system.

2. NVR to include programming for a maximum of 14-day recording time only.

2.4 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:

1. Network (IP) Indoor/Outdoor Panoramic Dome Type Camera:

a. Basis of Design: Axis Communications P3807-PVE.

b. Camera Type: True day/night with IR cut filter.

c. Resolution: Up to 4320x1920.

d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.

e. Minimum Illumination: 0.17 lux color, 0.05 lux black and white.

f. Lens: 3.2mm fixed.

g. Video Streaming: Supports 3 encoding types using E.265, H.264, MJPEG compression .

h. Power: Power over Ethernet (IEEE 802.3af) or 24 VAC as indicated or as required.

2. Network (IP) Indoor/Outdoor Wide Angle Dome Type Camera:

a. Basis of Design: Axis Communications M3205-LVE.

b. Camera Type: True day/night with IR cut filter.

c. Resolution: Up to 1920x1080.

d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.

e. Minimum Illumination: 0.2 lux color, 0.04 lux black and white.

f. Lens: 3.1mm fixed.

g. Video Streaming: Supports 3 encoding types using E.265, H.264, MJPEG compression .

h. Power: Power over Ethernet (IEEE 802.3af) or 24 VAC as indicated or as required.

D. Camera Enclosures and Mounting Brackets:

1. Where not factory-installed, provide accessory camera enclosures suitable for operation under the service conditions at the installed location.

2. Where not factory-installed, provide accessory camera mounting brackets necessary for installation.

2.5 ACCESSORIES

A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

B. Provide components as indicated or as required for system power and network connections.

C. Provide cables as indicated or as required for connections between system components.

1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP), CAT6, complying with Section 27 10 00.

D. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 05 29.

D. Wiring Method: Unless otherwise indicated, use cables (not in conduit).

1. Use suitable listed cables in wet locations, including underground raceways.
2. Use suitable listed cables for vertical riser applications.
3. Use listed plenum rated cables in spaces used for environmental air.
4. Install wiring in conduit for the following:
   a. Where required for rough-in.
   b. Where required by authorities having jurisdiction.
   c. Where exposed to damage.
   d. Where installed outside the building.
   e. For exposed connections from outlet boxes to cameras.
5. Conduit: Comply with Section 26 05 34.
6. Conceal all cables unless specifically indicated to be exposed.
7. Cables in the following areas may be exposed, unless otherwise indicated:
   a. Equipment closets.
   b. Within joists in areas with no ceiling.
8. Route exposed cables parallel or perpendicular to building structural members and surfaces.
9. Include service loop cable lengths to allow relocation of cameras within 30

ft of installed location.

E. Provide grounding and bonding in accordance with Section 26 05 26.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

G. Identify system wiring and components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. Prepare and start system in accordance with manufacturer's instructions.

B. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

C. Program system parameters according to requirements of Owner.

D. Test for proper interface with other systems.

E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide (2) four-hour training sessions for a total of (8) hours of training.
3. Location: At project site.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

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SECTION 28 31 00

FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system requirements

B. Fire alarm equipment

C. Fire alarm peripheral devices

1.02 RELATED SECTIONS

A. Basic electrical materials and methods are specified in Specifications Section 20 70 26 - Common Materials and Methods for Electrical Systems.

B. Training of personnel is specified in Specifications Section 01 79 00 - Demonstration and Training.

1.03 DEFERRED APPROVAL REQUIREMENTS

A. Fire Alarm system is a deferred approval. Any installation of the systems shall not be started until detailed design documents and specifications, including state fire marshal listing numbers for each component of the system have been submitted. Contractor to generate shop drawings and get county fire department approval.

1.04 REFERENCES

A. California Code of Regulations (CCR):

1. Title 24, Part 2, California Building Code
2. Title 24, Part 3, California Electrical Code
3. Title 24, Part 9, California Fire Code
4. Title 8, Cal OSHA
5. Title 19, Public Safety

B. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code (NEC)

2. NFPA 72 National Fire Alarm and Signal Code.

3. NFPA 72D Installation, Maintenance, and Use of Proprietary Protective Signaling

4. NFPA 72H Testing Procedures for Local, Auxiliary, Remote Station, and Proprietary Protective Signaling Systems

5. NFPA 101 Life Safety Code

C. Underwriters Laboratory (UL)

1. UL 268 Smoke Detectors for Fire Protective Signaling Systems

1.05 SUBMITTALS

A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data and Samples, for submittal requirements and procedures.

B. Shop Drawings and Product Data: Detection and alarm system submittals shall include, as a minimum, the following information, data, and drawings:

1. Complete descriptive data indicating UL listing for all system components;

2. Complete sequence of operation of the system; and

3. Complete system wiring diagrams for components capable of being connected to the system and interfaces to equipment supplied by others.

4. Battery calculations, booster power supply voltage drop calculations.

5. Wire schedules and riser diagrams.

C. Testing Program: The completed fire alarm system shall be fully tested in accordance with NFPA 72 under the observation of the Engineer and subject to approval by the Local Fire Marshal. Submit test procedures before performing tests. Testing program shall include the following information, listings, and instructions:

1. Statement of procedure objective, scope of test, and list of equipment/system to be tested.

2. List of equipment required to set up and perform the tests.

3. List of prerequisite tests that need to be completed before the procedure can be performed.

4. Description of the required procedure setup, including diagrams illustrating test equipment connections and identifying test points, where applicable.

5. Step-by-step instructions for performing the procedure, identifying the points where data is to be recorded and the limits for acceptable data.

6. Provisions for recording pertinent test conditions and environment at time of test.

7. Instructions for recording data on data sheets and verifying that procedure steps have been completed.

D. Test Reports: Submit results of electrical continuity, insulation, and ground continuity tests performed on installed wiring.

E. Operation and Maintenance Manual: Submit operation and maintenance data, where not provided under other Sections, for the equipment and systems provided, in accordance with Section 01 78 23 - Operation and Maintenance Data.

F. Shop Drawings: Shop Drawings of the fire alarm and detection system shall be submitted to Engineer for approval. The Contractor shall submit a copy of the same document to the Local Fire Marshal for review. All comments from Local Fire Marshall shall be submitted to Engineer. Contractor shall be responsible for obtaining necessary permits and certifications for all the fire detection and alarm systems work. Engineer's approval shall be obtained before beginning of installation work.

G. Fire Alarm Record of Completion: See Attachment A.

1.06 QUALITY ASSURANCE

A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by the Underwriters Laboratories Inc. (UL), and shall bear the "UL" label. Control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing will not be acceptable.

B. In addition to the UL-UOJZ requirement specified above, the system controls shall be UL listed for Power Limited Applications in accordance with California Electrical Code, Article 760. All circuits shall be marked in accordance with California Electrical Code, Article 760-22.

1.07 SITE CONDITIONS

A. Inspect surfaces and structures to, and on, which products will be installed before the work of this Section begins. Provide surfaces and structures

capable of supporting the products. Surfaces that will be concealed by products shall be finished before products are installed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fire alarm equipment shall be standard products of the Notifier Co., Edwards Systems Technology, Siemens Building Technologies, Inc. Johnson Controls and Gamewell-FCI, or equal.

2.02 FIRE ALARM SYSTEM

A. Furnish and install a complete addressable fire alarm system as indicated. The system shall be wired, connected, and left in first-class operating condition. Performance and capacities of signaling line circuits shall be in accordance with NFPA 72, Class X; Door holder circuit in accordance with NFPA 72, Class D; Printer circuit in accordance with NFPA 72, Class E; and initiating device circuits shall be in accordance with NFPA 72, Class A. The system shall be electrically supervised, and shall use closed loop initiating device circuits with individual zone supervision, individual indicating appliance circuit supervision, incoming and standby power supervision. Provide a control panel, manual pull stations, automatic smoke and heat detectors, annunciator, all wiring, connections to devices, outlet boxes, junction boxes, and all other material and accessories as necessary for a complete operating system.

B. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component. All fire alarm system components shall be California State Fire Marshall listed (CSFM).

C. The system alarm operation subsequent to the alarm activation of any manual pull station, automatic detection device, or sprinkler flow switch shall be as follows:

1. The appropriate initiating device circuit’s red LED shall flash on the control panel and the remote annunciator until the alarm has been silenced at the control panel or the remote annunciator. Once silenced, this same LED shall latch on. A subsequent alarm received after silencing shall flash the subsequent zone alarm LED on the control panel.

2. A pulsing alarm tone shall occur within the control panel until silenced.

3. All alarm-indicating appliances shall sound in a Continuous Ringing Alarm pattern or Designated State Code pattern until silenced by the

Alarm Silence Switch at the control panel or the remote annunciator.

4. All visual alarm lamps shall operate in a continuous pattern until extinguished by the Alarm Reset Switch.

5. Activate a supervised signal to notify the Operations Control Center or other specified notifying parties.

6. Manual Pull Station: Use metal, recessed pull-lever, open circuit type manual pull stations to permit transmission of an alarm for fire drills or tests. To protect the station, install a tamper-proof, clear polycarbonate shield and frame that fits easily over the pull station. When the shield is lifted to gain access to the pull station, a loud piercing warning sound shall be activated. The audio device shall be powered by the Fire Alarm Control Panel (FACP). Finish of the pull station shall consist of a base color of red with white lettering instructions. All outdoor or trackway pull stations shall be water-proof; protected with appropriate water tight housing and shall meet ADA requirements.

D. The alarm indicating appliances may be silenced by authorized personnel upon entering the locked control panel and operating the Alarm Silence Switch or by use of the key operated switch at the remote annunciator. A subsequent zone alarm shall reactivate the signals.

E. Elevator lobby smoke detector shall generate fire recall of elevator via FACP. If the alarmed detector is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.

F. The activation of any system smoke detector shall initiate an Alarm Verification operation whereby the control panel shall reset the activated detector and wait for a second activation. If, after reset, a second alarm is reported from the same or any other smoke detector within one minute, the system shall process the alarm in accordance with the operations listed above. If no second alarm occurs within one minute, the system shall resume normal operations. The Alarm Verification shall operate only for smoke detectors. Other activated initiating devices shall process alarms immediately.

G. Activation of Standpipe or Sprinkler Tamper Switch and Trouble Silence Switch:

1. The activation of any standpipe or sprinkler tamper switch shall activate a distinctive system supervisory audible signal and illuminate a "Sprinkler Supervisory Tamper" LED at the system control panel and the remote annunciator. There shall be no confusion between valve tamper activation and opens and grounds on fire alarm initiation circuit wiring.

2. Activating the Trouble Silence Switch will silence the supervisory audible signal while maintaining the Sprinkler Supervisory Tamper LED

indicating the tamper contact is still activated.

3. Restoring the valve to the normal position shall cause the audible signal and LED to pulse at a March Time Rate.

4. Activating the Trouble Silence Switch will silence the supervisory audible signal and restore the system to normal.

H. Actuation of the program "Test Set-Up" switch at the control panel shall activate the "Walk Test" mode of the system that shall cause the following functions to occur:

1. Control relay functions shall be bypassed.

2. The control panel shall show a trouble condition.

3. The alarm activation of any initiation device shall cause the audible signals to pulse one round of code identifying the initiation circuit (e.g., an activated smoke detector connected to Zone 4 shall pulse the audible signals four times in rapid succession).

4. The panel shall automatically reset itself.

5. Any momentary opening of an initiating or indicating appliance circuit shall cause the audible signals to sound for four seconds to indicate the trouble condition.

I. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system and shall initiate a trouble condition at the control panel.

J. Supervision of the system shall include the following features and functions:

1. All auxiliary manual controls shall be supervised so that all switches will be returned to the normal automatic position to clear system trouble.

2. Each independently supervised circuit shall include discrete amber "Trouble" LED to indicate disarrangement conditions per circuit.

3. The incoming power to the system shall be supervised so that any power failure shall be audibly and visually indicated at the control panel and the annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.

4. The system batteries shall be supervised so that disconnection of a battery shall initiate audible and visual indication at the control panel and the annunciator.

5. The System Expansion Modules connected by ribbon cables shall be supervised for module placement. Should a module become disconnected from the CPU, the system trouble indicator shall illuminate and an audible trouble signal shall sound.

6. Wiring to a remote annunciator shall be supervised for open and ground conditions. An independent annunciator trouble indicator shall illuminate and an audible trouble signal shall sound at the control panel.

K. The system shall include the following electrical power requirements:

1. The primary operating power shall be 120 V ac, 60 Hz, no-break system power supplied with integral battery chargers capable of recharging the standby batteries to 80 percent capacity within 12 hours. The control panel shall receive 120 V ac power via a dedicated standby circuit.

2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 V ac power in a normal supervisory mode in accordance with NFPA 72. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 80 percent capacity in 12 hours.

3. The secondary power supply for fire emergency voice/alarm communications service shall be capable of operating the system under quiescent load (system operating in a non- alarm condition) for a minimum of 24 hours and then shall be capable of operating the system during a fire or other emergency condition for a period of 15 minutes at maximum connected load.

4. All circuits requiring system-operating power shall be 24 V dc and shall be individually fused at the control panel.

5. Faults on ancillary circuits shall not interfere with the operation of the alarm and detection system.

6. Ancillary devices shall have separate power source. Faults on ancillary circuits shall not interfere with the operation of the alarm and detection system.

L. The system shall be an addressable fire alarm system complete with built-in or portable reprogramming capabilities so that all reprogramming or reconfiguration of the fire alarm system can be accomplished without removal of any solid-state devices. Hardware, software, and passwords used in programming the system and the I/O Map shall be submitted to the Engineer.

M. The fire alarm system shall support either BACNet or LonWorks

communication based integration interface. The integration interface shall allow an external monitoring center's system to receive and display, in real time all notification alarms from the fire alarm system.

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2.03 EQUIPMENT

A. Fire Alarm Control Panel (FACP):

1. Each FACP shall be capable of supporting up to 800 addressable devices. Use twisted pairs shielded solid wire for addressable loops. Tapping is permitted.

2. Each addressable device shall have a unique address. The manufacturer shall program each address to a system input zone and correlate to output operations as indicated. Non-functioning, non-addressed and non-programmed devices shall report trouble. Provide for site modification to the addressable programming. Provide for removal of devices without the necessity of readdressing any other devices.

3. Provide installation flexibility by ensuring that the physical sequence (placement) of the devices on the loop need not determine the device address. Installation tables shall be furnished to identify all device addresses.

4. The FACP shall provide an integral service console that allows qualified service technicians to complete the following operations:

   a. Enable/disable system options;

   b. Configure a remote annunciator;

   c. Set periods for various system timers;

   d. Set evacuation signal rate;

e. Program relays and signals;

f. Set system time and date; and

g. Perform verification tests.

5. The FACP shall be provided with a 40-column, panel-mounted printer.

6. The FACP shall be provided with a built-in Field Programming Tool/Diagnostics Tool. This tool shall allow a qualified service technician to perform multiple level programming, detailed system diagnostics, and to print system summary reports.

7. The FACP shall provide independent dry contacts on all alarm zones, including system trouble for remote annunciation on a 24 V dc Supervisory Control and Data Acquisition (SCADA) system.

8. Provide a handset in the FACP for connection to the P.A. system via PABX for convenient use. Provide modular components.

9. The system shall be housed in a NEMA 12 wall-mounted cabinet, red in color, with a door and viewing windows. All annunciator indications, operating controls, and instructions shall be clearly visible through the viewing window. The door shall be provided complete with a lock and two keys.

10. A Liquid Crystal Display (LCD) of 2 lines by 40 characters shall be provided to annunciate each addressable device in zones, and represent these zones by alarm or trouble LEDs. Locate the LEDs on the control panel.

11. The FACP shall provide LED annunciation for all alarm zones with the following indications and controls: power on, reset, silence, trouble, and alarm.

B. Common Controls/CPU:

1. The CPU shall be self-configurable and able to map to the display module by I/O module type. It shall have field-programmable software capable of being programmed and configured on site using either a built-in service console or a serial port for connection of a portable laptop computer. A set of diagnostic equipment including laptop computer, cable connections, and associated software shall be provided.

2. Provide an LCD/Common Control with an 80-character LCD display and membrane switches for common control and programming functions.

3. Universal display modules with LEDs and membrane switches shall connect to the CPU and shall provide all zone annunciation and/or control functions. A slide-in designation label shall be provided to simplify changes to zone designations and language.

4. Provide the following common control switches and indicators: Detection Signal Operated LED, Common Trouble LED, Power ON LED, Enable Zone LED, Enable Zone Disconnect Switch and LED, Detection Signal Replay Sequence, Disable all Auxiliary Relays, Standby Power Trouble, Test All Lamps, All Clear, Annunciator Trouble, Ground Fault, and Reset System.

5. In addition, the LCD CPU/Common Control shall provide the following switches and functions: Alarm Queue Switch and LED, Supervisory Queue Switch and LED, Trouble Queue Switch and LED, Display I.D. Switch, Program Menu Switch, Cancel Switch, Previous Switch, Next Switch, and Enter Switch. These switches provide operator interface to the system software and function as programming keys.

   a. The Liquid Crystal Display (LCD) shall be of the super twist high contrast type with 80 characters. Provide non-interleaving event display by type sorting input events into queues. Types shall be fire alarm, supervisory alarm, trouble, and monitor.

   b. Provide a LED for each queue to indicate the presence of events. Provide queue select control switches to allow user selection of the event type to display. Provide previous and next control switches to allow scrolling through a list of events. Provide all that is required to support site programming. Use a smart menu scheme to guide the user through programming sequences. Initiate trouble if programming input is incomplete.

C. Remote Annunciator:

1. The remote annunciator shall provide LED annunciation for all alarm zones with the following indications and controls: power on, reset, trouble, and alarm.

2. The remote annunciator shall indicate alarm conditions for serial wiring supervision, data integrity, and power. A common trouble alarm indication shall be provided for grounds, opens, and shorts. The remote annunciator enclosure shall be flush-mounted and of NEMA 3R construction with stainless steel door.

D. Alarm Input Modules:

1. The input module shall be power-limited circuits and field programmable

for any of the following operations:

a. Class B non-verified or verified Alarm input;
b. Normally open or normally closed Supervisory Inputs;
c. Monitor inputs; and
d. Remote Switch Inputs.

2. Each normally open sprinkler supervisory device shall be connected to a dedicated addressable transponder. Each supervisory addressable input device alarm or trouble operation shall be annunciated on the FACP and remote annunciator LCD's. Each supervisory device shall have an individual status LED.

2.04 FIRE ALARM PERIPHERAL DEVICES

A. Manual Pull Stations: Provide metal, recessed pull-lever breakglass, open circuit type manual addressable pull station, utilizing spring retention feature (glass rod not acceptable), capable of being reset with the same key as for the FACP. By using the key, authorized personnel can activate the manual pull station. Finish the station in red with white lettered instructions, which shall read: "Local Alarm - Does Not Alert Fire Department."

B. Automatic Detectors:

1. Provide stable, solid state, addressable, ionization detectors capable of detecting smaller invisible sub-micron sized particles, and photo-electric to detect larger visible particles that is in air duct applications. Provide the detectors with a measuring chamber and a protected reference chamber sensitive to changes in temperature and humidity only. Protect the measuring chamber from damage and insects.

2. Provide a built-in five second delay to minimize detection signals due to transient smoke. Safeguard radioactive parts and protect circuitry against electrical transients, electromagnetic interference, and polarity reversal. Factory set the detector sensitivity and provide for field adjustment within the range of UL defined sensitivity.

3. The detector shall be tamper-resistant and plug-mounted to a separate base. A built-in shorting device shall permit checking of the installation wiring before detector installation.

C. Auxiliary Devices:

1. Provide remote control relays connected to supervised auxiliary circuits for control of fans, dampers, door releases, fare gate releases, and escalator shutdown. Relay contact ratings shall be 5 A at 120 V ac resistive or 2.5 A at 120 V ac inductive for a 0.50 power factor.

2. Provide a normally open dry contact from the FACP to initiate an automatic announcement on the station public address system upon activation of the manual pull station. Also provide a 90-second delay timer circuit in the FACP as indicated that shall initiate shutdown of station escalators upon activation of the manual pull station.

3. Provide a dry contact for initiation of elevator recall to egress level.

D. Visual Alarms: Provide visual alarms (strobe lights) for the hearing impaired in accordance with applicable requirements of the Americans with Disabilities Act (ADA) and the following requirements:

1. Lamps shall be a xenon strobe type or equivalent. Color shall be clear or nominal white (unfiltered or clear filtered white light.)

2. Maximum pulse duration shall be 0.2 second with a maximum duty cycle of 40 percent. Pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal.

3. Intensity shall be a minimum of 75 cd.

4. Flash rate shall be a minimum of 1 Hz and a maximum of 3 Hz.

5. The appliance shall be placed 80 inches above the highest floor level within the space or 6 inches below the ceiling; whichever is lower.

E. Audio Alarm: Provide speaker for audio alarm with pre-recorded message capability. Audio characteristics shall meet NFPA-72.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fire Detection and Alarm System shall be designed by personnel who are factory trained and certified for fire alarm system design of the proposed approval type and brand. The Contractor shall submit designer's plans and specifications for approval.

Detection and Alarm System installer shall be factory trained and certified for fire alarm system installation of the proposed approved type and brand.

B. Interface and Coordination: Indicated diagrams and details show the general location and arrangement of equipment, conduit, wiring, and devices. Provide outlets, control and detection devices, and equipment properly located and readily accessible. Control and detection devices, equipment, and outlets shall be located to avoid interference with mechanical, architectural, and structural features.

C. Wiring Methods:

1. All wiring shall be installed in a continuous GRS conduit system. All conduits shall be concealed.

2. Prepare and submit a Fire Alarm Riser Diagram indicating type and quantity of devices and size and quantity of conductors and conduits.

3. No wiring other than that directly associated with fire alarm detection, alarm, or auxiliary functions shall be permitted in fire alarm conduits. Wiring splices shall be avoided to the extent possible and if needed, they shall be made only in junction boxes and shall be connected with crimp-type connectors. Wire nut-type connections are not acceptable.

4. Transposing or changing color-coding of wires will not be permitted. All conductors in conduit containing more than one wire shall be labeled on each end with wire markers conforming to the requirements of Specifications Section 26 05 24 - Low Voltage Wires and Cables. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded. All controls and function switches shall be clearly labeled on all equipment panels.

5. All wiring shall be checked and tested to ensure that there are no grounds, opens, or shorts. The minimum allowable resistance between any two conductors or between conductors and ground is 10 M□ as checked by a Megger after all conduit, conductors, and detector bases have been installed, but before the detector devices are plugged into the bases or end-of-line devices installed.

6. All conduits entering or leaving the terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner. A number shall be used only once.

7. All conductors shall be tagged, labeled, and color-coded. Color-coding shall be by wire insulation, not taping or banding. The numbering and color-coding shall be continuous for each circuit wire.

8. Wire shall be numbered at each connection, termination, and junction point. Wire numbering tags shall be professionally manufactured wire-markers. Each group of wires shall be tagged with its destination at each panel, terminal box, or junction box.

D. Control Panels: Control and other panels shall be mounted with sufficient clearance for observation and testing. All fire alarm junction boxes shall be clearly marked for easy identification. Flexible connectors shall be used for all detection device-mounting boxes. Junction boxes and panels shall be

securely hung and fastened with appropriate fittings to ensure positive grounding throughout the entire system.

E. Pre-testing: The system shall be completely pre-tested prior to final acceptance testing. All points shall be tested from point of initiation to the final point or points of annunciation. All circuits shall be tested for continuity and ability to transmit the required signal correctly to the FACP. Any problem due to wrong wire type, wire twist, impedance, mismatches, noise filtering, or shielding shall be corrected during pre-testing and prior to any final acceptance tests. Pre-testing shall include every device in the system. Coordinate with other trades as necessary for testing. Provide the following tests and procedures:

1. Sprinkler Flow Switches: Record time delay from water flow to alarm, and adjust as necessary for 30 to 50 seconds delay.

2. Valve Tamper Switches: Verify "trouble" signal is received on closing of each valve.

3. Smoke Detectors: Test with actual or approved artificial smoke. Verify that reset does not occur when devices are cleared of smoke. Verify supervisory circuit function.

4. Elevator Recall: Verify that elevators recall to designated floor.

5. Central Notification: Verify that one set of conductors in the terminal cabinet becomes a short circuit on any "trouble" condition and that the other set becomes a short circuit on any "Alarm" condition. Verify that the conductor groups are labeled properly.

3.02 FIELD QUALITY CONTROL

A. Provide the testing program, qualified technical personnel, tools, test equipment, and other items required to perform the tests. The Engineer shall witness all tests and certify the recorded results.

B. Furnish written notice as to when installed equipment will be tested so that the Engineer and Authority Having Jurisdiction can be present to witness the tests. A minimum of 30 calendar days prior notice of a proposed test shall be provided.

C. At the Contractor's option, a representative of the equipment manufacturer may be present to witness the tests and verify the results.

D. These tests shall not alter the Contractor's guaranty of the equipment. Replace and retest work and materials found to be not in compliance with

Specification requirements.

E. Test splice points back to previous splice or terminal points before encapsulant is placed around the splice point.

F. Maintain test data sheets showing the results of tests performed. Provide data sheets listing the acceptable or specified test limits and the values actually measured. Furnish one set to the Engineer. Retain one set.

G. Provide data sheets showing the test set-up, the equipment used, the names of persons performing the test, the names of witnesses, the date, the location, and the serial number of the equipment under test. The test data sheets will be reviewed by the Engineer and accepted as submitted, or additional tests may be required. If additional tests are required because initial test results do not comply with these Specifications, the retesting shall be documented and submitted as before, at no additional cost to the District.

H. Perform tests in accordance with Article 3.01.B.5 above.

I. Perform inspection of control panel as follows:

1. The inspection shall first cover a physical check of panels in reference to the following items:

   a. Proper model numbers.

   b. Arrangement of instruments per Shop Drawings on panel front.

   c. Arrangement of back-mounted accessories for proper clearance, operation, and maintenance.

   d. Installation of wiring and accessories for conformance with the Contract Drawings and Specifications.

   e. Finish of panel.

   f. Tagging of wiring.

2. After completion of the physical inspection, perform circuit checkouts as required to verify the correct operation of the system.

3. Check electrical instruments and each electrical circuit for continuity either by checking entire "loops" if within panel or by simulating field conditions or operations. This test shall include instruments, alarms, relays, and pressure switches that are part of the panel circuits. When full simulation is not possible or practicable, wires shall be given a point-to-point continuity check.

J. Perform final checkouts and test. Ship panels only after required factory tests

are performed and required modifications or corrections are made. A factory certificate of inspection is required before shipment and shall accompany the shipping documents.

3.03 TRAINING SESSIONS

A. In addition to the requirements of Section 01 79 00 - Demonstration and Training, shall comply with the specific training requirements specified herein.

B. Provide two 4-hour training sessions in the operation and maintenance of the fire detection and alarm systems for facility maintenance personnel prior to acceptance by the Engineer of the installed systems. Training sessions shall be conducted by a representative of the fire detection and alarm system's manufacturer or supplier. The training sessions shall enable a qualified service technician to troubleshoot and maintain the system.

C. The Contractor shall schedule the training sessions through the Engineer at a time convenient to the District. The Contractor shall notify the Engineer of the proposed training session dates at least six weeks prior to those dates. The sessions shall include the following training:

1. Classroom-type training, giving course participants an understanding of the overall system and its operation.

2. Hands-on training, giving course participants actual trouble-shooting and maintenance experience. This shall include training in user-level programming of the FACP to perform routine maintenance tasks such as deleting a device or zone, or reprogramming the FACP to recognize a substitute or replacement device.

D. Provide professionally prepared training manuals to supplement the Operation and Maintenance Manuals and submit them to the Engineer for review and approval at least two months prior to the start of classroom instruction. The training manuals shall be prepared specifically for use as training aids as follows:

1. Each course participant shall receive copies of the Operation and Maintenance Manuals, training manuals, and other pertinent material prior to the commencement of training sessions.

2. The District shall retain the master and two additional copies of all training manuals and materials as reference documentation.

3. Upon completion of each course, instructor's manuals, Operation and Maintenance Manuals, training manuals, and training aids shall become the property of the District. Throughout the Contract and guaranty period, it shall be the responsibility of the Contractor to supply the District with all changes and revisions to the training manuals and other

documentation.

4. The Contractor shall provide all special tools, equipment, training aids, and any other materials required to train course participants. The number of special tools and other training equipment shall be adequate for the number of participants attending the course.

Attachment A
Fire Alarm Record of Completion

FIRE ALARM RECORD OF COMPLETION

To be completed by the system installation contractor at the time of system acceptance and approval.
2007 Edition, NFPA 72 is used as reference in this form

1. **PROTECTED PROPERTY INFORMATION**
Name of property: _____
Address:_____
Description of property_____
Name of property representative:_____
Address: _____
Phone: _____ Fax:_____ E-mail:_____
Authority having jurisdiction over this property:_____
Phone:_____Fax:_____E-mail:_____

2. **FIRE ALARM INSTALLATION, SERVICE AND TESTING INFORMATION**
Installation contractor for this equipment: _____
Address: _____
Phone:_____Fax:_____E-mail:_____
Service organization for this equipment: _____
Address: _____
Phone:_____Fax:_____E-mail:_____
Location of as-built drawings: _____
Location of system operations and maintenance manuals: _____
A contract for test and inspection in accordance with NFPA standards is in effect as of: _____ **Contracted testing company**: _____
_____ Address:_____
Phone:_____Fax:_____E-mail:_____
Contract Expires: _____Contract number:_____
Frequency of routine inspections: _____

3. **TYPE OF FIRE ALARM OR SERVICE**
NFPA 72 Chapter Reference of System Type:_____
Name of organization receiving alarm signals with phone numbers (if applicable):
Alarm:_____
Supervisory:_____
Trouble:_____
Entity to which alarms are retransmitted:_____ Phone:_____
If Chapter 8, note the means of transmission from the protected premises to the central station:

☐ Digital alarm communicator ☐ McCulloh ☐ Multiplex ☐ 2-way radio ☐ 1-way radio ☐ N/A

If Chapter 9, note the type of connection: ☐ Local energy ☐ Shunt ☐ N/A

3.1 System Software

Operating system (executive) software revision level:_____

Site-specific software revision date: _____

Completed by: _____

4. **SIGNALING LINE CIRCUITS**
Characteristics of signaling line circuits connected to this system (see NFPA 72, Table 6.6.1):
Quantity: _____ Style:_____ Class:_____

5. **ALARM-INTIATING DEVICES AND CIRCUITS**
Characteristic of initiating device circuit connected to this system (see NFPA 72, Table 6.5)
Quantity:_____ Style:_____ Class:_____

5.1 Manual Initiating Devices

5.1.1 Manual Pull Station Number of manual pull stations: _____
Type of devices: ☐ Addressable ☐ Conventional ☐ Coded
☐ Transmitter ☐N/A

5.2 Automatic Initiating Devices

5.2.1 Area Smoke Detectors Number of smoke detectors: _____
_____ Type of coverage: ☐ Complete area ☐ Partial area ☐ Non-required partial area ☐ N/A Type of device: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A
Type of smoke detector sensing technology: ☐ Ionization ☐ Photoelectric

5.2.2 Duct Smoke Detectors Number of duct smoke detectors:_____
Type of Coverage:_____
Type of devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A
Type of smoke detectors sensing technology: ☐ Ionization ☐ Photoelectric

5.2.3 Heat Detectors Number of heat detectors: _____
Type of coverage: ☐ Complete area ☐ Partial area
☐ Non-required partial area ☐ N/A Type of devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐N/A

5.2.4 Interface Module for Existing Sprinklers Waterflow Detectors
Number of interface module detectors:_____
Type of devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A

5.2.5 Alarm Verification Number of devices subject to alarm verification: _____ Alarm verification on this system is: ☐ Enabled ☐ Disabled ☐ Set for ___ seconds

6. **SUPERVISORY SIGNAL-INTIATING DEVICES AND CIRCUITS**

6.1 Interface Module for Existing Sprinkler System Number of valve temper switches:___ Type of devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A

6.2 Fire Pump

Type of fire pump: ☐ Electric ☐ Diesel

Type of fire pump supervisory devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A

Fire Pump Functions Supervised

☐ Fire pump power ☐ Fire pump running ☐ Fire pump phase reversal ☐Selector switch not in auto ☐ Engine or control panel trouble☐ Low Fuel

Other:_____

6.3 Engine- Driven Generator

Type of generator supervisory devices: ☐ Addressable ☐ Conventional ☐ Coded ☐ Transmitter ☐ N/A ☐ Engine or control panel trouble ☐ Generator running ☐ Selector switch not in use

☐ Low fuel Other: _____

7. ANNUNICIATORS

7.1 Annunciator 1 ☐ Local ☐ Remote

Type: ☐ Addressable ☐ Directory ☐ Graphic ☐ N/A Location: _____

7.2 Annunciator 2 ☐ Local ☐Remote

Type: ☐ Addressable ☐ Directory ☐ Graphic ☐ N/A Location: _____

7.3 Annunciator 3 ☐ Local ☐ Remote

Type: ☐ Addressable ☐ Directory ☐ Graphic

☐ N/A Location:_____

8. ALARM NOTIFICATION DEVICES AND CIRCUITS

8.1 Emergency Voice Alarm Service

Number of single voice alarm channels:_____ _____ Number of multiple voice alarm channels:_____ Number of speakers: _____Number of speaker zones: _____

8.2 Telephone Jacks

Number of telephone jacks installed: _____

Number of Telephone handsets stored on site:_____

Type of telephone system installed: ☐ Electrically powered ☐ Sound powered ☐ N/A

8.3 Nonvoice Audible System

Characteristics of notification device circuit connected to this system (see NFPA 72, Table 6.7):

Quantity:_____

Style:_____Class:_____

8.4 Type and Quantities of Nonvoice Notification Appliances Installed

Bells: _____With visual device: ___Horns:_____ With visual device:_____

Chimes: ___With visual device: ___Bells:_____With visual device:_____

Visual device without audible devices: _____

_____

9. EMERGENCY CONTROL FUNCTIONS ACTIVATED

☐ Hold-Open Door Releasing Device ☐ Smoke Management or Smoke Control ☐ Door Unlocking ☐ Elevator Recall ☐ Other

10. SYSTEM POWER SUPPLY

10.1 Primary Power

Nominal voltage:_____ Amps_____

Overcurrent protection: Type: _____Amps_____

Location (of primary supply panelboard): _____

Location:_____

10.2 Secondary Power

Location: _____Type:_____ Nominal voltage: _____

Current rating: _____

Number of standby batteries:_____ Amp hour rating:_____

Location of batteries:_____

Calculated capacity of secondary power to drive the system

In standby mode: _____ In Alarm mode:_____

11. RECORD OF SYSTEM INSTALLATION

Fill out after all installation is complete and wiring has been checked for opens, shorts, ground faults, and improper branching, but before conduction operational acceptance tests.

The system has been installed in accordance with the following NFPA standards: (Note any or all that apply).☐ NFPA 72

☐ NFPA 70, *National Electric Code, Article 760* ☐ Manufacturer's published instructions

☐ Other (specify): _____

System deviations from referenced NFPA standards: _____

Signed:_____ Date:_____

Print Name_____Title:_____

Organization:_____ Phone:_____

12. RECORD OF SYSTEM OPERATION

All operational features and functions of this system were tested by or in the presence of signer below on the date shown below, and were found to be operating property in accordance with the requirements of:

☐ NFPA 72 ☐ NFPA 70, National Electrical Code, Article 760 ☐ Manufacturer's published instructions ☐ Other (specify):

☐ Documentation in accordance with Inspection and Testing Form (Figure 10.6.2.3) is attached Signed:_____Date:_____

Print Name_____ Title:_____

Organization:_____Phone:_____

13. CERTIFICATIONS AND APPROVAL

13.1 System Installation Contractor

This system as specified has been installed and tested according to all NFPA standards citied herein.

Signed:_____ Date:_____

Print Name_____Title:_____

Organization:_____ Phone:_____

13.2 System Service Contractor

This system as specified has been installed and tested according to all NFPA standards citied herein.

Signed:_____ Date:_____

Print Name_____ Title:_____

Organization:_____ Phone:_____

13. CERTIFICATIONS AND APPROVAL

13.3 Central Station

This system as specified has been installed and tested according to all NFPA standards citied herein.

Signed:_____ Date:_____

Print Name_____ Title:_____

Organization:_____ Phone:_____

13.4 Property Representative

I accept this system as having been installed and tested to its specifications and all NFPA standards citied herein.

Signed:_____ Date:_____

Print Name_____ Title:_____

Organization:_____ Phone:_____

13.5 Authority Having Jurisdiction

I have witnessed a satisfactory acceptance test of this systems and find it to be installed and operating properly in accordance with its approved plans and specifications, its approved sequence of operations, and with all NFPA.

Signed:_____ Date:_____

Print Name_____Title:_____

Organization:_____Phone:_____

END OF SECTION 28 31 00

DIVISION 31

EARTHWORK

SECTION 31 2200

GRADING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site grading, including:

1. Import or export of soils as required to complete grading.
2. Rough grading and shaping of site.
3. Final finish grading and shaping of site.
4. Removal from site and proper disposition of all debris and excess material resulting from the work.
5. Fill and compact holes resulting from tree removal.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Geotechnical Report.

B. Division 02 Section “Site Demolition”

C. Division 31 Section "Excavation and Fill for Utilities".

D. Division 31 Section "Excavation and Fill for Structures".

E. Division 31 Section "Erosion and sedimentation controls".

F. Division 32 Section "Asphalt Concrete Paving".

G. Division 32 Section “Site Concrete Work”.

1.03 DEFINITIONS

A. Dewatering: Control of surface water runoff and ground water accumulation.

1.04 QUALITY ASSURANCE

A. Tests and Inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Required tests:
   a. Fill material: Determine suitability of fill material not previously evaluated.
   b. Maximum density tests: Determine optimum moisture content and maximum dry density of fill materials placed and compacted in accord with ASTM D 1557, Procedure A.
   c. Field density tests: Determine in-place density of fill materials placed and compacted in accord with ASTM D 1556, ASTM D 2922, or ASTM D 2937. Provide one test for every 10,000 sq. ft. per lift.

d. Certification of all subgrade improvements and engineered fills and subgrades with respect to their adequacy and suitability values for intended uses.

e. Suitability and classification testing for all soils of unknown characteristics prior to use as compacted fills.

f. Other tests as may be required by Owner.

3. Required inspections and controls:

a. General inspection of stripping of surfaces and removal of root mat, peat, organic soils (muck), clay, and other unsuitable material.

b. Detailed inspection of exposed subgrades prior to finishing or placing fill materials.

c. Continuous control of placing and compacting of all engineered fills.

d. Continuous inspection and monitoring during placing and compacting operations.

e. Observation and consultation in processes of bank shaping, safety in excavations, dewatering, and identification of materials encountered.

B. Requirements of regulatory agencies: In addition to complying with other legal requirements, comply with the following.

1. Code of Federal Regulations Title 29 CFR Part 1926, Subpart P, Excavations.

2. Occupational Safety and Health Administration Document 2226.

C. Reference specifications and standards:

1. ASTM: D 1556 Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM: D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf/ft3).
3. ASTM: D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
4. ASTM: D 2937 Density of Soil In-Place by the Drive-Cylinder Method.
5. CFR: Title 29 CFR Part 1926 Safety and Health Regulations for Construction.

6. OSHA: Document 2226 Excavations.

D. Allowable tolerances:

1. Grading elevations and contours: Accuracy of final grading elevations and contour shall be the responsibility of a civil engineer or land surveyor licensed in the State of California.

2. Grade (cut or fill) site to the elevations indicated on Drawings within the following tolerances:

a. All cuts and fills: Within a tolerance ±0.10 feet for grades indicated on Drawings.

b. Structures at or on grade: Within 0.02 feet (including hardscape).

PART 2 - PRODUCTS

2.01 MATERIALS

A. On-site and borrow fill:

1. Nonexpansive, predominantly granular material:

   a. Particles less than 2 inch in any dimension;

   b. Free of organic and inorganic debris;

   c. Not more than 12 percent by weight passing the No. 200 sieve.

2. Acceptable to geotechnical engineer retained by Owner.

3. Top soil: All soil above the lower root line of fine vegetation (grasses and sod).

4. Borrow site: At location approved by Owner.

B. Recycled fill: Refer to Division 02 Section "Selective Site Demolition". Limit use as follows:

1. Not more than 10 percent (by volume, compacted) of total fill.

2. Not less than 2 feet below bottom of concrete foundations.

3. Imported, recycled fill is not acceptable.

PART 3 - EXECUTION

3.01 PROTECTION

A. Public and adjacent properties: Protect in accord with applicable laws and ordinances.

B. Existing on-site features, plant life, including trees, scheduled to remain:

1. Protect from damage at all times.

2. Do not allow earth-moving equipment within the branch spread perimeter (drip line) of existing trees.

C. Utilities:

1. When utility line excavation occurs near existing utilities, whether or not indicated on Drawings, maintain existing utility services fully operational. Protect and support utility lines in a manner to prevent damage. Method of protection is subject to Owner's approval.

2. Expeditiously repair damaged utilities at no cost to Owner.

3. Remove abandoned lines encountered during excavating and dispose of off-site. Report unidentified lines to Owner prior to removal.

4. Capping and rerouting of indicated active utility lines encountered during Work of this Section will be performed as part of the work of section pertaining to utility encountered.

D. Dust control:

1. Throughout entire construction period, effectively dust-palliate working area, unpaved roads, and involved portions of site.

2. Palliation: Intermittently water and sprinkle with such frequency as will satisfactorily allay dust at all times. Chemical treatment of any type is not permitted.

3. Use of reclaimed water shall conform to requirements and guidelines of governing health authorities and be specifically approved by Owner.

3.02 STRIPPING AND CLEARING

A. Strip dry ground areas of all topsoil, surface vegetation, muck, roots, organic material, and debris to result in a uniform surface of exposed clean, natural sand or soils.

B. Except as directed otherwise by Owner, dispose of all waste materials to legal off-site disposal areas.

C. Soil redistribution: Do not redistribute existing soils beyond immediate area of origin.

3.03 EXCAVATIONS

A. Excavate materials of every nature to dimensions and elevations indicated. Use equipment of suitable type for materials and conditions involved.

B. Where additional excavation is required to remove unsatisfactory materials encountered, such additional work shall be paid for by means consistent with terms of the Contract.

C. Remove from site materials not approved for use as topsoil or fill and excess excavated materials.

3.04 FILLING, COMPACTING, AND GRADING

A. Filling:

1. Place fill in uniform lifts not exceeding 8 inches in loose thickness that will uniformly compact to the required densities.

2. Bring each layer to between ±2 percent of optimum moisture content before compaction. Add water by uniform sprinkling and mixing with soil. Add or blend additional fill materials or dry out existing materials as required.

3. When moisture content and condition of each layer is satisfactory, compact to specified density. Compact areas not accessible to motor-driven equipment with mechanical or heavy hand tampers.

4. Rework compacted areas failing to meet specified density as determined by tests. Recompact and retest as required or directed to achieve proper density.

5. Correct unauthorized excavation made below depth indicated, as acceptable to geotechnical engineer retained by Owner, at no additional cost to Owner.

6. Do not place fill materials until subgrade is acceptable to geotechnical engineer retained by Owner, nor until preceding fill layer is acceptable.

7. Prior to placing fill material on existing surfaces, scarify to a depth of 6 inches and recompact to same degree of compaction as overlying fill material.

B. Compacting:

1. Parking and pavement areas: Compact soils below all parking areas, walks, slabs, and asphalt pavement to 90 percent of the Modified Proctor maximum dry density for full depth of fill.
2. Landscape areas: Compact soils below all landscape, planting ,and sod areas to 85 percent of the Modified Proctor maximum dry density for the full depth of fill.
3. Minor structures: Support catch basins and other minor structures on bottom and all sides by soils compacted to 90 percent of the Modified Proctor maximum dry density for full depth of fill.

C. Grading:

1. Grade (cut or fill) site to the elevations indicated on Drawings within the following tolerances:
   a. All cuts and fills: Within a tolerance ±0.10 feet for grades indicated on Drawings.
   b. Structures at or on grade: Within 0.02 feet (including hardscape).
2. Elevations and contours indicated on Drawings are to finish grade unless otherwise indicated. Make allowances for pavement thickness, bases, mulch and planting material where applicable.

3.05 DEWATERING

A. Prevent surface water drainage from entering excavations, and ponding on subgrades and other prepared work areas.

B. Maintain dry excavations and subgrades by whatever means necessary while working in each area.

1. Reroute surface water drainage away from excavations, prepared subgrades, and other work areas.
2. Prevent excessive rainwater, to the extent that detrimental softening, undermining, washout, and similar damage would occur, from accumulating in excavations, upon subgrades, and at other prepared work areas.
3. Do not use excavations as temporary drainage.

C. Dewatering methods selected by Contractor shall be subject to approval by Owner.

END OF SECTION

SECTION 31 23 02

EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Dewatering, excavating, shoring, sheeting, bracing, trenching, backfilling, and all other earthwork operations required for utility and other underground lines and appurtenances.

B. Providing access to open trenches after utility lines have been installed and bedded, but prior to backfilling being commenced, to permit recording of record or "as-built" survey information.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Geotechnical Report.

B. Division 26 Electrical Sections applicable to the scope of work.

C. Division 33 Section "Underground Utilities Marking".

1.03 QUALITY ASSURANCE

A. Tests and inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Test methods:
   a. Maximum dry density of backfill materials shall be determined by ASTM D 1557, Procedure A.
   b. Field density tests shall be determined by ASTM D 1556, ASTM D 2922, or ASTM D 2937.
3. Required tests:
   a. Backfill material: Determine suitability of backfill and bedding material not previously evaluated.
   b. Maximum density tests: Determine optimum moisture content and maximum dry density of backfill and bedding materials placed and compacted.
   c. Field density tests: Determine in-place density of backfill materials placed and compacted. Conduct one test for every 100 linear feet of trench and one test for each 1 foot vertical lift.
   d. Other tests as may be required by Owner.
4. Required inspections:
   a. Excavation inspection: Detailed inspection of exposed excavations prior to placing bedding and backfill material.

b. Bedding conditions: Determine and evaluate condition of bedding to receive utility lines.

B. Requirements of regulatory agencies: In addition to complying with other legal requirements, comply with the following.

1. Code of Federal Regulations Title 29 CFR Part 1926, Subpart P, Excavations.

2. Occupational Safety and Health Administration Document 2226.

C. Reference specifications and standards:

1. ASTM: D 1556 Density and Unit Weight of Soil in Place by the Sand-Cone Method.

2. ASTM: D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf/ft3).

3. ASTM: D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM: D 2937 Density of Soil In-Place by the Drive-Cylinder Method.

5. CFR: Title 29 CFR Part 1926 Safety and Health Regulations for Construction.

6. OSHA: Document 2226 Excavations.

1.04 SUBMITTALS

A. Procedures: In accordance with Division 01 Sections.

B. Drawings and engineering design calculations: Signed and sealed engineering drawings and calculations for required shoring, sheeting, or cribbing for approval prior to starting installation of shoring, sheeting, or cribbing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. On-site materials: Materials obtained by selective stockpiling of excavated soils.

1. Bedding: Unless indicated otherwise on Drawings, conform to the following.

a. Clean sand and native free-draining granular materials, free from all vegetation and debris or as indicated on Drawings.

b. Bedding shall meet gradation requirements when tested in accord with ASTM D 422 and have a minimum sand equivalent of 30 as determined by ASTM D 2419.

Sieve Size	% Passing Sieve by Weight
1/2 in.	100
No. 4	70 - 100
No. 16	50 - 90
No. 50	10 - 50
No. 200	0 - 10

2. Backfill: Clean material, free from all vegetation and debris. Do not use rocks or lumps larger than 2 inches in any dimension.

B. Borrow fill:

1. Nonexpansive, predominantly granular material:

a. Particles less than 2 inches in any dimension;

b. Free of organic and inorganic debris;

c. Not more than 12 percent by weight passing the No. 200 sieve behind retaining walls and 25 percent elsewhere.

2. Acceptable to geotechnical engineer retained by Owner.

PART 3 - EXECUTION

3.01 PROTECTION

A. Public and adjacent properties: Protect in accord with applicable laws and ordinances.

B. Existing on-site features, plant life, including trees, scheduled to remain:

1. Protect from damage at all times.

2. Do not allow earth-moving equipment within the branch spread perimeter (drip line) of existing trees.

3. Do not cut tree roots over 2 inches in diameter without prior approval from Owner.

4. Support trees during excavation in an approved manner.

5. When excavation adjacent to existing trees is necessary, use all possible care to avoid injury to trees and tree roots. Excavate by hand all areas where 2 inch and larger roots occur. Tunnel under and heavily wrap with burlap roots 2 inches and larger in diameter, except directly in the path of pipe or conduit, to prevent scarring or excessive drying. When a trenching machine runs close to trees having roots smaller than 2 inches in diameter, hand trim wall of trench adjacent to tree, making clean cuts through roots. Paint roots 1 inch and larger in diameter with two coats of Tree Seal, or Owner-approved equivalent. Close trenches adjacent to trees within 24 hr.; when this is not possible, shade side of trench adjacent to tree with burlap or canvas.

6. All work around and adjacent to existing trees, including inspection prior to backfill, shall be approved by Owner. Obtain Owner's approval in writing for all procedures prior to commencement of work. Trees that die due to damage or unacceptable work shall be back-charged to Contractor.

C. Where utility line excavation occurs in lawn, grassed, or landscaped areas, carefully remove and stockpile sod and plants to preserve for transplanting.

1. Place excavated material from trenches on lawn or grass, provided a drop cloth or other approved method is employed to protect lawn or grass from permanent damage. Do not keep stockpiled materials on lawn or grass for more than 72 hr.

2. Immediately after completion of backfilling and testing of utility lines, replace sod and replant plants in a manner to restore lawn, grass, and landscaping to its original condition within practical limits. Replace damaged landscaping at no cost to Owner as part of the work of this Section.

D. Where utility line excavation occurs in paved areas, saw-cut existing pavement along straight, uniform lines such that the amount of pavement cut and removed shall be the minimum consistent with safe excavation practices.

1. Do not use removed pavement as backfill material.

2. Replace removed pavement with new pavement to match existing in accord with Project Specifications.

E. Open trenches: Barricade all open trenches during work hours and cover at the close of each day's work.

F. Utilities:

1. When utility line excavation occurs near existing utilities, whether or not indicated on Drawings, maintain existing utility services fully operational. Protect and support utility lines in a manner to prevent damage. Method of protection is subject to Owner's approval.

2. Expeditiously repair damaged utilities at no cost to Owner.

3. Remove abandoned lines encountered during excavating and dispose of off-site. Report unidentified lines to Owner prior to removal.

4. Capping and rerouting of indicated active utility lines encountered during Work of this Section will be performed as part of the work of section pertaining to utility encountered.

G. Dust control:

1. Throughout entire construction period, effectively dust-palliate working area, unpaved roads, and involved portions of site.

2. Palliation: Intermittently water and sprinkle with such frequency as will satisfactorily allay dust at all times. Chemical treatment of any type is not permitted.

3. Use of reclaimed water shall conform to requirements and guidelines of governing health authorities and be specifically approved by Owner.

H. Water control:

1. Maintain trenches and other excavations free of water while lines are being placed and until backfill has been completed and approved.

2. Maintain adequate pumping equipment at all times to provide for emergencies.

3. Dispose of water in such a manner as not to create a nuisance, cause damage to property, or interfere with activities of other contractors. Prevent water from migrating outside of construction areas. Use Owner-approved methods and materials to confine water to construction areas. Failure to contain water is not permitted.

4. Dewater as required to maintain site in a relatively dry condition, including well point dewatering.

5. Methods of dewatering and disposal of water are subject to Owner's approval.

I. Bracing and shoring:

1. Support excavations in accord with all legal requirements.

2. Set and maintain sheet piling and shoring timbers in a manner that will prevent caving of walls of excavations or trenches and not impose other loads or surcharges on lines.

3. When it is impractical to remove shoring and bracing, obtain approval from Owner to leave in place. Record locations of such "in-place" shoring and bracing on Project Record Documents.

J. Stockpiled excavated materials: Confine excavated materials to immediate area of stockpiled location.

K. Soil redistribution: Do not redistribute any existing soils beyond the immediate area of origin.

3.02 EXCAVATION

A. General: Include removal of materials and obstructions that interfere with the execution of the Work.

1. Unless indicated otherwise, excavation for utilities lines shall be by open trench.

2. Sides of trenches shall be as nearly vertical as practicable.

3. Obtain prior approval from Owner for use of tunneling.

B. Trench widths:

1. Lines less than 6 inches outside diameter: 18 inches minimum.

2. Larger lines: Clear distance on each side of line of not less than 8 inches or more than 1/2 of outside diameter of line.

C. Trench depth: Excavate trenches to lines and grades as necessary for construction of utility lines indicated.

D. Over-excavation: Backfill over-depth excavations to required grade with specified bedding and backfill material. Compact bedding and backfill material to specified density.

E. Perform any dewatering and pumping required to keep excavations free of standing water.

F. Refer to geotechnical reports for seasonal high groundwater table elevation estimates. It is the sole responsibility of contractor to make its own judgments as to the actual conditions, and to draw its own conclusions as to means and methods required for performance of the work. Provide dewatering, if required, at whatever elevation groundwater is actually encountered.

G. A plan for any proposed dewatering shall be submitted for approval prior to commencement of any such work. Any permitting for dewatering which may be required shall be the responsibility of Contractor.

H. Sequence, schedule, coordinate, and perform the work so as to maintain safe, unobstructed passage as required for emergency egress and general site access. Provide any and all bridging of trenches of work, barricades, etc., that may be required to comply with this requirement.

3.03 BACKFILL

A. General: Backfill consists of bedding, backfill, and restoration of surface.

B. Bedding: Bedding is defined as material supporting, surrounding, and extending to 12 inches above the top of utility line. Bedding shall not be required under or around structures, except at utility lines.

1. Do not cover lines until they have been inspected and approved for alignment and grade and recording of record or "as-built" survey information has been performed.
2. Commence bedding immediately after approval and survey information recording, to preclude damage to utility lines.
3. Carefully place bedding around utility lines so as not to displace or damage line, and fill symmetrically on each side of line to 12 inches above top of line.
4. Compact bedding to 90 percent of the maximum dry density in accord with ASTM D 1557 using mechanical equipment.

C. Backfill: Backfill includes material from 12 inches above the lines to, and including, surface restoration.

1. Do not backfill against structures until concrete has attained sufficient strength to withstand loads, and structures have been approved.
2. Place backfill in loose uniform lifts not exceeding 8 inches.
3. Use mechanical compactors for compaction of backfill.

D. Coordinate and ensure installation of underground utilities marking in accord with Division 33 Section "Underground Utilities Marking".

E. Compacting:

1. Parking and pavement areas: Compact soils below parking areas, walks, slabs, and asphalt concrete pavement to 90 percent of the maximum dry density in accord with ASTM D 1557 for full depth of fill.
2. Landscape areas: Compact soils below landscape, planting, or sod areas to 85 percent of the maximum dry density in accord with ASTM D 1557 for full depth of fill.
3. Building areas: Compact soils below all buildings and for a distance of 5 feet beyond perimeter footing to at least 90 percent of the maximum dry density in accord with ASTM D 1557 for full depth of fill.
4. Minor structures: Support catch basins and other minor structures on bottom and all sides by soils compacted to 90 percent of the maximum dry density in accord with ASTM D 1557 for full depth of fill.

3.04 ADJUST AND CLEAN

A. Surface restoration:

1. Restore surface areas over trenches equivalent to conditions which existed prior to start of work.
2. Reconstruct surfaces in accord with applicable Sections of the Specifications.

B. Disposal:

1. Debris:
   a. Remove and dispose of all rubbish, debris, and vegetation as it accumulates.
   b. Dispose of debris off-site or at an on-site disposal area designated by Owner.
2. Excess soil: Stockpile at an on-site area designated by Owner.

END OF SECTION

PART 4 -

EXCAVATION AND FILL FOR UTILITIES

4.01 31 2302 - 7

SECTION 31 23 04

EXCAVATION AND FILL FOR STRUCTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavating, backfilling, and compacting for structures.

B. Restore grades to required elevations.

C. Remove excess materials from site.

D. Pumping and dewatering.

E. Support of excavations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Geotechnical Report.

B. Division 03 Section "Cast-In-Place Concrete".

C. Division 31 Section “Site Clearing”.

D. Division 31 Section "Excavation and Fill for Utilities".

1.03 QUALITY ASSURANCE

A. Tests and inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Test methods:
   a. Maximum dry density of backfill materials shall be determined by ASTM D 1557, Procedure A.
   b. Field density tests shall be determined by ASTM D 1556, ASTM D 2922, or ASTM D 2937.
3. Required tests:
   a. Backfill material: Determine suitability of backfill material not previously evaluated.
   b. Maximum density tests: Determine optimum moisture content and maximum dry density of backfill materials placed and compacted.
   c. Field density tests: Determine in-place density of backfill materials placed and compacted. one test for every 100 cu. yd. of material placed and one test for each 1 foot vertical lift.
   d. Other tests as may be required by Owner.
4. Required inspections:
   a. Excavation inspection: Detailed inspection of exposed excavations prior to placing backfill material.

b. Placement and compaction inspection: Continuous inspection and monitoring.

B. Requirements of regulatory agencies: In addition to complying with other legal requirements, comply with the following.

1. Code of Federal Regulations Title 29 CFR Part 1926, Subpart P, Excavations.

2. Occupational Safety and Health Administration Document 2226.

C. Reference specifications and standards:

1. ASTM: D 1556 Density and Unit Weight of Soil in Place by the Sand-Cone Method.

2. ASTM: D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf/ft3).

3. ASTM: D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM: D 2937 Density of Soil In-Place by the Drive-Cylinder Method.

5. CFR: Title 29 CFR Part 1926 Safety and Health Regulations for Construction.

6. OSHA: Document 2226 Excavations.

1.04 SUBMITTALS

A. Procedures: In accordance with Division 01 Sections.

B. Drawings and engineering design calculations: Signed and sealed engineering drawings and calculations for required shoring, sheeting, or cribbing for approval prior to start of installation of shoring, sheeting, or cribbing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. On-site materials and borrow fill:

1. Nonexpansive, predominantly granular material:

a. Particles less than 2 inches in any dimension.

b. Free of organic and other deleterious materials.

c. Not more than 12 percent by weight passing the No. 200 sieve behind retaining walls and 25 percent elsewhere.

2. Acceptable to a geotechnical engineer retained by Owner.

3. Top soil: All soil above the lower root line of fine vegetation (grasses and sod).

4. Borrow site: At location approved by Owner.

PART 3 - EXECUTION

3.01 PROTECTION

A. Public and adjacent properties: Protect in accord with applicable laws and ordinances.

B. Existing on-site features, plant life, including trees, scheduled to remain:

1. Protect from damage at all times.
2. Do not allow earth-moving equipment within the branch spread perimeter (drip line) of existing trees.
3. Do not cut tree roots over 2 inches in diameter without prior approval from Owner.
4. Support trees during excavation in an approved manner.
5. When excavating adjacent to existing trees is necessary, use all possible care to avoid injury to trees and tree roots. Excavate by hand areas where 2 inch and larger roots occur. Tunnel under and heavily wrap with burlap roots 2 inches and larger in diameter, except directly in the path of pipe or conduit, to prevent scarring or excessive drying. When a trenching machine runs close to trees having roots smaller than 2 inches in diameter, hand trim wall of trench adjacent to tree, making clean cuts through roots. Paint roots 1 inch and larger in diameter with two coats of Tree Seal, or Owner-approved equivalent. Close trenches adjacent to trees within 24 hr.; when this is not possible, shade side of trench adjacent to tree with burlap or canvas.
6. All work around and adjacent to existing trees, including inspection prior to backfill, shall be approved by Owner. Obtain Owner's approval in writing for all procedures prior to commencement of work. Trees that die due to damage or unacceptable work shall be back-charged to Contractor.

C. Utilities:

1. When utility line excavation occurs near existing utilities, whether or not indicated on Drawings, maintain existing utility services fully operational. Protect and support utility lines in a manner to prevent damage. Method of protection is subject to Owner's approval.
2. Expeditiously repair damaged utilities at no cost to Owner.
3. Remove abandoned lines encountered during excavating and dispose of off-site. Report unidentified lines to Owner prior to removal.
4. Capping and rerouting of indicated active utility lines encountered during Work of this Section will be performed as part of the work of section pertaining to utility encountered.

D. Dust control:

1. Throughout entire construction period, effectively dust-palliate working area, unpaved road, and involved portions of site.
2. Palliation: Intermittently water and sprinkle with such frequency as will satisfactorily allay dust at all times. Chemical treatment of any type is not permitted.
3. Use of reclaimed water shall conform to requirements and guidelines of governing health authorities and be specifically approved by Owner.

E. Water control:

1. Maintain excavation free of water while foundations are being placed and until backfill has been completed and approved.
2. Maintain adequate pumping equipment at all times to provide for emergencies.
3. Dispose of water in such a manner as not to create a nuisance, cause damage to property, or interfere with activities of other contractors. Prevent water from migrating outside of construction areas. Use Owner-approved methods and materials to confine water to construction areas. Failure to contain water is not permitted.
4. Dewater as required to maintain site in a relatively dry condition, including well point dewatering.
5. Methods of dewatering and disposal of water is subject to Owner's approval.

F. Cribbing and shoring:
1. Provide temporary or permanent cribbing, sheeting, and shoring as necessary to safely retain earth banks and protect excavations from caving or other damage.
2. Design, install, and maintain cribbing, sheeting, and shoring and remove after use.

G. Stockpiled excavated materials: Confine excavated materials to immediate area of stockpiled location.

H. Soil redistribution: Do not redistribute existing soils beyond immediate area of origin.

3.02 STRIPPING

A. Stockpile materials from excavations suitable for use in fill and backfill.

B. Remove from site materials not approved for use as topsoil, fill or backfill, and excess excavated materials.

3.03 EXCAVATING

A. Excavate materials of every nature to dimensions and elevations indicated on Drawings. Use equipment of suitable type for materials and conditions involved.

B. Extend excavation a sufficient distance from walls to allow for forming and shoring, application of waterproofing, installation of services, and approvals. Do not excavate below indicated depths.

C. Foundations: Excavations may be made to net sizes plus 2 inches for casting concrete directly against earth banks, provided, in opinion of Owner, earth banks are sufficiently stable to remain in position until concrete has been placed.
1. If, in opinion of Architect/Engineer, earth banks are not stable enough for concrete placement, excavate additional width necessary to provide space for formwork, and backfill after forms have been removed.
2. All trenches shall be formed.

D. Correct unauthorized excavation made below depths indicated on Drawings, as recommended by geotechnical engineer retained by Owner, at no additional cost to Owner.

E. Where additional excavation is required to remove unsatisfactory materials encountered, such additional work shall be paid for by means consistent with terms of Contract.

3.04 FILL, BACKFILL, AND COMPACTION

A. Fill and backfill:

1. Place earth fill and backfill in layers that will uniformly compact to required densities, but in loose layers not more than 8 inches thick.

   a. Place backfill only after walls have been supported by completion of interior floor systems or have been sufficiently braced to resist imposed loading.

   b. Place backfill against walls below grade after waterproofing systems have been completed and approved.

   c. Protect waterproofing systems during backfill operations.

   d. If waterproofing is damaged, do not continue backfilling until membrane damage is repaired as approved by Owner.

   e. Restore grades to indicated elevations.

2. Slurry cement (lean concrete) backfill:

   a. Where specifically indicated on Drawings, slurry cement backfill consisting of a fluid, workable mixture of aggregate, cement, and water shall be used as foundation structure backfill.

   b. Cement shall be Portland cement conforming to provisions in Division 03 Section "Cast-In-Place Concrete", except that testing will not be required.

   c. Water used for slurry cement backfill shall be free from oil, salts, and other impurities which would have an adverse effect on quality of backfill material.

   d. At Contractor's option, aggregate shall be either 1) material selected from excavation, imported material, or a combination thereof, which is free of organic material and other deleterious substances, or 2) commercial quality concrete sand. Material selected from excavation, imported material, or a combination thereof shall meet the following grading:

Sieve Sizes	Percentage Passing
1-1/2 in.	100
1 in.	80-100
3/4 in.	60-100
3/8 in.	50-100
No. 4	40-80
No. 100	10-40

   e. Aggregate, cement, and water shall be proportioned either by weight or by volume. Not less than 188 lb. of cement shall be used for each cu. yd.

of material produced. Water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of aggregate while being placed.

f. Materials for slurry cement backfill shall be thoroughly machine-mixed in a pugmill, rotary drum, or other approved mixer. Mixing shall continue until cement and water are thoroughly dispersed throughout material. Slurry cement backfill shall be placed in the Work within 1 hr. after mixing.

g. Slurry cement backfill shall be placed in a uniform manner that will prevent voids in, or segregation of, backfill and will not float or shift foundation structures. Foreign materials which fall into trench prior to or during placing of slurry cement backfill shall be immediately removed.

h. Placing material over slurry cement backfill shall not commence less than 4 hours after slurry cement backfill has been placed.

B. Compaction:

1. Bring each layer to with ±2 percent of optimum moisture content before compaction. Add water by uniform sprinkling. Jetting and flooding are prohibited. Add and blend additional fill materials or dry out existing materials as required.

2. When moisture content and condition of each layer is satisfactory, compact to not less than 90 percent of maximum dry density in accord with ASTM D 1557.

3. Compact areas not accessible to motor-driven equipment with mechanical or heavy hand tampers.

4. Rework compacted areas failing to meet specified maximum dry density, as determined by tests. Recompact and retest as required to achieve 90 percent of the maximum dry density in accord with ASTM D 1557.

C. Grading:

1. Build compacted backfills to indicated or required finish grades, less allowances for thickness of slabs, paving, and required base courses.

2. Rough grade backfilled surfaces smooth, level to within 0.10 foot of intended surface. Compact loose material and maintain in a moist condition until covered.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Erosion, sedimentation and water pollution control features in place or relocated as indicated on Drawings, prior to start of all grading or construction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Temporary facilities and controls.

B. Division 31 Section "Grading".

1.03 DEFINITIONS

A. Control features: Includes, but not limited to berms, erosion control blankets, gravel bags, sandbags, silt barriers, silt fences, swales, and other features in accord with referenced specifications and standards.

1.04 QUALITY ASSURANCE

A. Performance criteria: Prevention, control and abatement of erosion, sedimentation and water pollution shall be in accord with:

1. California Stormwater Best Management Practice Handbook for Construction, Section "Best Management Practices for Erosion and Sedimentation Control".
2. As indicated on Drawings and as called for in the Owner's Storm Water Pollution Prevention Plan (SWPPP) and Notice of Intent.
3. As established under the accepted Contractor's Stormwater Management Plan (CSMP):
   a. Contractor shall prepare a comprehensive CSMP for the management of incident and transient storm water within the limits of work, or such larger area as may be indicated on the plans.
   b. Contractor shall provide a qualified SWPPP developer (QSD) and qualified SWPPP practitioner (QSP) for the project to implement the SWPPP per the requirements of the current California Statewide Construction General Permit. Contractor shall prepare and submit on the SMARTS system any amendments or Changes of Information necessary during construction. Contractor shall provide all materials necessary to obtain a Notice of Termination for the project.
   c. Contractor's plan shall indicate all measures required to comply with the applicable requirements of the SWPPP as relates to the Work and the situation within limits of work during the Contract Time.
   d. The SWPPP was prepared solely for the purpose of expediting permitting for the Work, and Owner's having prepared same shall not be construed

as relieving Contractor of any responsibility it has to establish and maintain proper stormwater management pursuant to any applicable regulations. Neither shall Owner's review or approval of the CSMP relieve Contractor of such responsibility.

B. Reference specifications and standards:

1. California Stormwater Best Management Practice Handbook for Construction.

1.05 SUBMITTALS

A. Procedures: In accordance with Division 01 Sections.

B. Shop drawings: Plans and details, including layout and locations of erosion and sedimentation control features. Indicate dimensions, materials, and anchorage underlying substrates.

C. Product data:

1. Manufacturer's detailed technical materials and application data.

2. Submit filter fabric material specifications and installation configuration prior to start of construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for control features: In accord with referenced specifications, standards, and approved submittals.

PART 3 - EXECUTION

3.01 ERECTION

A. General: Erect and maintain control features in accord with Drawings and referenced specifications, standards, and approved submittals and the final SWPPP.

B. Maintenance:

1. Inspect control features immediately after each rainfall and similar event, and at least once a day during periods of prolonged rainfall and similar events. Immediately repair control features to maintain intended function and performance. Inspections shall be conducted based on the requirements of the Construction General Permit and approved SWPPP.

2. Replace sandbags and other materials that exhibit damage, decomposition, or are otherwise ineffective.

3. Prevent excessive accumulation of sediment deposits. Remove sediment deposits at a frequency of not less than after each rainfall and similar event.

3.02 Removal of control features.

A. Remove control features when directed by Owner.

END OF SECTION

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Asphalt concrete paving.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 31 Section "Grading".

B. Division 32 Section “Site Concrete Work”.

C. Division 32 Section "Pavement Markings and Bumpers".

1.03 QUALITY ASSURANCE

A. Tests and inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Required tests:
   a. Compaction:
      1) Crushed aggregate and crushed miscellaneous base: Perform field density tests in accord with SSPWC Section 211-2
      2) Asphalt concrete surface course: Perform field density tests in accord with SSPWC Section 302-5.6.2.
   b. Water flood tests of finished paving: In addition to tests and requirements of SSPWC Section 302-5.6.2, conduct a water flood test of areas as directed by Owner.
3. Required inspections:
   a. Base:
      1) Verify that base meets or exceeds specified base course.
      2) Visually observe uniformity and moisture condition of base material as it is delivered to project site.
      3) Observe and monitor placement and construction of base material to ensure that work meets or exceeds specified requirements.
      4) Make random depth checks before and after final compaction to assure minimum compacted thickness is obtained.

B. Reference specifications and standards:

1. ASTM: C 136 Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM: C 150 Portland Cement.
3. ASTM: D 558 Moisture-Density Relations of Soil-Cement Mixtures.
4. ASTM: D 977 Emulsified Asphalt.

5. ASTM: D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf/ft3).
6. ASTM: D 2026 Cutback Asphalt (Slow-Curing Type).
7. ASTM: D 2028 Cutback Asphalt (Rapid-Curing Type).
8. ASTM: D 3320 Emulsified Coal-Tar Pitch (Mineral Colloid Type).
9. SSPWC: Standard Specifications for Public Works Construction.

1.04 SUBMITTALS

A. Procedures: In accordance with Division 01 Sections.

B. Product data: Manufacturer's detailed technical materials and application data, including technical bulletins, guides, and manuals for seal coat materials.

C. Certificates/certifications: Supplier's certification that materials conform to Specifications requirements.

1. Class and grade of asphalt concrete mixtures in accord with SSPWC Section 203.
2. Sieve analysis of asphalt concrete aggregates in accord with SSPWC Section 211-1.

1.05 PROJECT CONDITIONS

A. Existing conditions: Do not conceal or cover any work until required tests or inspections have been performed and accepted.

B. Environmental requirements: Unless recommended otherwise by material or product manufacturer conform to the following.

1. Apply or install products or systems only when ambient temperatures are above 50°F and rising.
2. Place base course when ambient temperature is above 40°F.

C. Protection: Protect completed installation from damage of subsequent construction activities. Immediately remove all foreign matter that accumulates on exposed surfaces in accord with fabricator or manufacturer's recommendations.

1. Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.
2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety, and to cause the least interruption of work.

D. Sequencing and scheduling:

1. Coordinate and sequence the application or installation of work of this Section with adjacent or integral materials, products, and work specified in other Sections. Such work includes, but is not limited to, the following:
   a. Concrete curbs and gutters.
   b. Concrete paving.
   c. Utility services.
   d. Demolition of existing asphalt concrete.

e. Cold mill existing asphalt concrete paving.

2. Order specified materials, products, and similar items with extended "long lead" (ordering) times, sufficiently in advance of scheduled application, or installation dates to not delay the scheduled progress of the Work. Such items include but are not limited to the following:

a. Items of rare ("short") supply.

b. Items not of standard stock.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed aggregate base: Conform to SSPWC Section 200 2.2.

B. Crushed miscellaneous base: Conform to SSPWC Section 200-2.4. Refer to Division 02 Section "Selective Site Demolition". Limit use as follows:

1. Confine to extent (areas and locations) where indicated on Drawings or as directed by Owner.

2. Imported material is not acceptable.

C. Asphalt concrete: Conform to SSPWC Section 203-6, B PG64-10 for base course, if required on the drawings, C2 PG64-10 for surface course, D2- or E PG64-10 for overlay filling and patching, unless indicated otherwise on Drawings.

D. Prime coat: Cutback asphalt, slow-curing, Grade SC 250, in accord with SSPWC Section 203 2 (ASTM D2026).

E. Tack coat: Anionic asphalt emulsion, slow-setting, Grade SS 1H, SSPWC Section 203 3.

F. Seal/slurry coat: If indicated on the plans.

1. New paving: Emulsified asphalt, Grade SS 1h, conforming to SSPWC Section 203-3 (ASTM D 977) blend of emulsified asphalt and coal-tar emulsion (not less than 10 percent).

2. Existing paving: Plant-blended asphalt emulsion and mineral aggregate mixture, conforming to SSPWC Section 203-9.

2.02 MIXES

A. Asphalt concrete: Plant mix in accord with SSPWC Section 203-6

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces for conditions that will adversely affect execution, permanence, and quality of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Proof-roll subgrade using heavy, rubber-tired rollers to locate unstable areas or areas requiring additional compaction.

B. Compact unstable areas or areas requiring additional compaction in accord with SSPWC Section 301-1.

C. Cold mill areas as shown on Drawings in accord with SSPWC Section 302-5.2.

3.03 APPLICATION/INSTALLATION/PERFORMANCE

A. Crushed aggregate and crushed miscellaneous base: Transport, spread, shape, compact, and finish crushed aggregate and crushed miscellaneous base material in accord with SSPWC Section 301-2, to minimum compacted thickness as indicated on Drawings. Compact in excess of 95 percent of Modified Proctor maximum dry density in accord with ASTM D 1557.

B. Asphalt concrete:

1. Prime coat: After base course has been placed to required grades and approved, apply prime coat in accord with SSPWC Section 302-5.3.

2. Tack coat: When new asphalt is to be placed against existing or new concrete or asphalt surfaces, such as curbs, gutters, walls, structures, or other paving, apply tack coat in accord with SSPWC Section 302-5.4.

3. Asphalt concrete: Provide transportation, placing, and compacting of asphalt concrete, preparation of application surfaces, joints, tolerances, and protection of finished asphalt in accord with SSPWC Section 302-5.

C. Seal/slurry coat: After asphalt concrete paving has sufficiently cured, apply seal/slurry coat in accord with SSPWC Section 302-8, unless otherwise recommended by manufacturer.

3.04 FIELD QUALITY CONTROL

A. Mixes: Do not deliver batches of base or asphalt concrete materials to job site which do not conform to specified requirements.

B. Flood test: All finished asphalt concrete paving surfaces that retains standing water when flood tested shall be deemed defective.

C. Physical defects: Any portion of asphalt concrete paving that exhibits creeping, shoving, cracking, raveling, softening, or other similar defects during warranty period shall be deemed defective.

D. Removal and replacement of defective asphalt concrete paving:

1. Remove and replace defective areas, including base and subgrade, as directed by Owner.

2. Cut away, remove, and fill patch area with fresh, hot asphalt concrete.

a. As a minimum, remove defective areas for full depth of asphalt concrete surfacing course.

b. Cut sides perpendicular and parallel to direction of traffic with edges vertical.

c. Apply tack coat to exposed asphalt concrete surfaces before placing new asphalt concrete mixture.

d. Compact by rolling to specified surface density and smoothness.

3.05 ADJUST AND CLEAN

A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphalt materials.

B. Protection: After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened.

END OF SECTION

SECTION 32 13 13

SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Site concrete work, including subgrade preparation, formwork, reinforcing steel, concrete, and accessory materials for:

1. Pavement, curbs, and gutters.
2. Walkways and steps.
3. Footings for fence posts, and similar work of other trades.
4. Mechanical and electrical equipment pads and light pole foundations.
5. Ductbanks.
6. Other site concrete work as indicated on Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Geotechnical Report.

B. Division 31 Section "Grading".

C. Division 32 Section "Asphalt Concrete Paving".

D. recast concrete and other use concrete specified as part of Division 22, Division 23 and Division 26.

1.03 DEFINITIONS

A. Slip resistance: Slip index of not less than 0.5 when tested dry and wet (with an unbroken film of pure water) in accord with ASTM F 1677 or ASTM F 1679, using a Neolite test pad.

1.04 QUALITY ASSURANCE

A. Geotechnical data: Refer to Geotechnical Report.

B. Tests and inspections:

1. Testing laboratory services: Refer to Division 01 Sections.
2. Soil bearing and compaction:
   a. Test methods:
      1) Maximum dry density of backfill materials shall be determined by ASTM D 1557, Procedure A.
      2) Field density tests shall be determined by ASTM D 1556, ASTM D 2922, or ASTM D 2937.
   b. Required tests:

1) Backfill material: Determine suitability of backfill material not previously evaluated.

2) Maximum density tests: Determine optimum moisture content and maximum dry density of backfill materials placed and compacted.

3) Field density tests: Determine in-place density of backfill materials placed and compacted. one test for every 1000 cubic yard of material placed and one test for each 1 foot vertical lift.

4) Other tests as may be required by Owner.

c. Required inspections:

1) Excavation inspection: Detailed inspection of exposed excavations prior to placing backfill material.

2) Placement and compaction inspection: Continuous inspection and monitoring.

3. Concrete: In accord with SSPWC Section 201-1.1.4 and as specified herein.

a. Portland cement: Furnish cement mill test reports and manufacturer's certification that cement complies with specification requirements.

b. Required tests:

1) Aggregate:

a) Hardrock aggregate: Test in accord with ASTM C 33.

b) Do not deliver aggregates to site or ready-mix plant until pit source has been approved, and plant, capacity, and ability to produce a uniform and continuous product has been verified.

c) Take samples from aggregate stockpiles assigned to project.

2) Slump tests: Make one slump test in accord with ASTM C 143 for each set of test cylinders: Make additional tests as may be ordered by Owner.

a) Make and keep an accurate record of all tests.

b) Maximum slumps: As specified hereinafter.

3) Test cylinders: Take one sample of four cylinders from each day's placement of 100 cubic yards or fractional part thereof of each mix design in accord with ASTM C 172. Take samples at evenly spaced intervals as concrete is deposited in forms. Mark cylinders with date, sample number, and location in structure from which sample was taken. Do not take more than one sample of four cylinders from any location or batch of concrete.

a) Make and store cylinders in accord with ASTM C 31.

b) Curing: At the end of 24 hours, take cylinders to laboratory and store under moist curing conditions at approximately 70°F until tested.

c) Testing: Test cylinders in accord with ASTM C 39. Test one cylinder at age of 7 days for information and two cylinders at 28 days for acceptance. Maintain one cylinder in reserve.

d) Seven-day strength: Not less than 60 percent of specified ultimate 28-day strength.

e) Mix adjustment: Should test results indicate concrete strength below specified 7-day or 28-day minimum requirements, decrease water/cement ratio and adjust mix proportions as necessary to achieve specified minimum strengths.

f) Concrete failures: Should test results indicate that concrete strength requirements for any portion of work does not conform to 28-day minimum requirements, secure core or prism specimens of hardened concrete and test in accord with ACI 301 and ASTM C 42.

g) Laboratory shall secure and test specimens under Owner's direction.

c. Ready-mix plant inspections:

1) Testing laboratory shall provide and maintain continuous inspection at plant to check sieve analysis for quality and moisture content of aggregates, check mix with design mixes, check cement being used with test reports, check loading of mixer trucks, and certify quantities of materials loaded in each mixer truck.

2) Certification: Provide batch tickets signed by dispatcher and testing laboratory inspector at ready-mix plant. Each batch ticket shall state batch quantities of cement, water, fine aggregates, coarse aggregates, and admixture contained in each truck load.

3) Deliver to Owner's representative on job site a properly signed ticket with each load of ready-mix concrete.

4. Reinforcing steel:

a. Quality control of identifiable steel:

1) Submit to laboratory copies of mill certificates for all types, sizes, and heats of reinforcing steel intended for use in the work. Include the following information:

a) Source of steel.

b) Description.

c) Heat number.

d) Yield point.

e) Ultimate tensile strength.

f) Elongation percentage in 8 in. length.

g) Bend test results.

h) Chemical analysis, including carbon equivalent (CE) of ASTM A 615 bars to be welded.

2) All costs in connection with tests and inspections of identifiable steel will be paid by Owner.

b. Quality control of unidentifiable steel:

1) When steel cannot be identified, testing laboratory shall make one series of tensile tests and one series of bend tests in accord with ASTM A 370 or ASTM A 615, for each 5 tons or fractional part thereof of each size and kind of reinforcing steel. Make tests using a minimum of two separate samples. Test full sections of bars as rolled.

2) All costs in connection with tests and inspections of unidentifiable steel will be paid by Contractor.

c. Field quality control for welding:

1) Inspection and tests of welds shall be made by testing laboratory for reinforcing bar welds, as follows:

a) Certification of welders engaged in electric-arc welding of reinforcing.

b) Inspection of reinforcing bar welds.

c) X-ray test of one of the first arc-welds made by each welder; full penetration splice welds.

d) Two tensile tests of sample welds of the largest size bar for each type of welding.

2) Owner will pay all costs in connection with tests and inspections for welding of reinforcing steel splices when such welding is indicated on Drawings.

3) All costs in connection with tests and inspections for welding of reinforcing steel splices not indicated on Drawings will be paid by Contractor.

5. Payment:

a. Owner will pay all costs for all tests and inspections except retests and reinspections required because of failures.

b. All costs incurred for retests and reinspections required because of failure of original tests will be paid by Contractor.

C. Reference specifications and standards:

1. ACI: 301 Specifications for Structural Concrete for Buildings.

2. ACI: 305 Hot Weather Concreting.

3. ACI: 306 Cold Weather Concreting.

4. ASTM: A 370 Mechanical Testing of Steel Products.

5. ASTM: A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

6. ASTM: C 31 Making and Curing Concrete Test Specimens in the Field.
7. ASTM: C 33 Concrete Aggregates.
8. ASTM: C 39 Compressive Strength of Cylindrical Concrete Specimens.
9. ASTM: C 42 Drilled Cores and Sawed Beams of Concrete, Obtaining and Testing.
10. ASTM: C 143 Slump of Hydraulic Cement Concrete.
11. ASTM: C 172 Sampling Freshly Mixed Concrete.
12. ASTM: C 1107 Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
13. ASTM: D 1556 Density of Soil in Place by the Sand-Cone Method.
14. ASTM: D 1557 Moisture-Density Relations of Soils Using 10 lb. Rammer and 18 in. Drop.
15. ASTM: D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
16. ASTM: D 2937 Density of Soil In-Place by the Drive-Cylinder Method.
17. ASTM: E 1155 Determining Floor Flatness and Levelness Using the F-Number System
18. ASTM: F 609 Using a Horizontal Pull Slipmeter (HPS).
19. ASTM: F 1677 Using a Portable Inclineable Articulated Strut Slip Tester, (PIAST).
20. ASTM: F 1679 Using a Variable Incidence Tribometer, (VIT).
21. SSPWC: Standard Specifications for Public Works Construction ("Green Book").

1.05 SUBMITTALS

A. Procedure: In accordance with Division 01 Sections.

B. Shop drawings: Plans, elevations, sections, and details, including layout of components and accessories. Indicate dimensions, clearances required, utility service requirements, materials, and finishes.

C. Manufacturer's detailed technical materials data, including technical bulletins, drawings, guides, and manuals, as applicable to the work of this Project, for the following:

1. Admixtures.
2. Curing materials.
3. Joint materials.
4. Nonshrink grout, including test data.

D. Certifications:

1. Cement mill test reports and certification.
2. Admixture certification, including chloride ion content.
3. Ready-mix batch plant tickets.
4. Reinforcing steel mill certifications.
5. Reinforcing steel welder's certifications.

E. Concrete mix designs: Submit, for approval, certified concrete mix designs for initial and any subsequent changes in mix designs.

1.06 PROJECT CONDITIONS

A. Existing conditions:

1. Do not conceal or cover any work until required tests and inspections have been performed and accepted.
2. Do not fabricate items which require fitting to other building elements or into building spaces, until dimensions have been verified at the site.

B. Environmental requirements: Unless otherwise recommended by product or system manufacturer or reference specifications or standards, conform to the following:

1. Do not place concrete when the ambient temperature is 35°F or lower or is expected to go below that temperature within 24 hours.
2. Do not place concrete during rain that will cause surface damage to concrete.
3. Hot weather concreting procedures: In accord with ACI 305.
4. Cold weather concreting procedures: In accord with ACI 306.

C. Traffic control:

1. Maintain vehicular and pedestrian traffic control during concrete operations.
2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety, and to cause the least interruption of work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: In accord with SSPWC Section 201-1, Portland Cement Concrete, type as indicated on Drawings.

1. Cement: Conform to SSPWC Section 201-1.2.1.
2. Admixtures: Conform to SSPWC Section 201-1.2.4.
3. Fine aggregates: Conform to SSPWC Section 200 1.5.3
4. Coarse aggregates: Conform to SSPWC Section 200 1.4.
5. Design slumps and mix proportioning: SSPWC Sections 201-1.1.2 and 201-1.1.3 except as follows.
   a. Provide concrete which will develop the minimum 28-day ultimate compressive strengths identified on the plans. Minium concrete compressive strength for flatwork is 2500 psi.

B. Formwork: Wood or equivalent metal, conforming to SSPWC Section 303-1.3.

C. Reinforcement: Conform to SSPWC Section 201-2.

D. Curing materials: Liquid or equivalent sheet membrane, conforming to SSPWC Section 201-4, except as specified herein.

E. Joint materials:

1. Construction joints: Preformed galvanized steel sheet or resawn wood.
2. Expansion joints: Premolded resilient filler, conforming to SSPWC Sections 201-3, except as specified herein.

F. Borrow material (for fill): Nonexpansive, predominantly granular material:
1. Particles less than 2 inches in any dimension;
2. Free of organic and inorganic debris;
3. Not more than 12 percemt by weight passing the No. 200 sieve.
4. Acceptable to a geotechnical engineer retained by Owner.

G. Non-shrink grout: Prepackaged, nonshrink, nonmetallic, natural aggregate grout conforming to ASTM C 1107, with minimum 28-day compressive strength of 5000 psi.
1. Hi-Flow or NS Grout by Euclid Chemical Company.
2. Five Star Grout by Five Star Products.
3. Master Flo 713 or 928 by Master Builders, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Compact top 6 inches subgrade to 95 percent of the Modified Proctor maximum dry density.

B. Do not allow traffic over prepared subgrade.

C. Uniformly moisten subgrade at time concrete is placed. Uniformly apply water immediately prior to concrete placement.

D. Accurately trim to required elevations, allowing for full thickness concrete.

3.02 WALKS AND SLABS

A. Construct in accord with SSPWC Section 303-5, except finishing and curing of integral color concrete shall be as follows.
1. Finishing:
a. Tamp freshly placed concrete with approved metal grid tampers not less than 12 inches by 12 inches in size so as to bring fines to top, then rod to uniform surfaces at required levels.
1) Float and trowel finish as soon as surface becomes workable.
2) Provide slopes as indicated on Drawings, or as directed by Architect.
b. During finishing maintain adequate surface moisture and reduce plastic shrinkage as recommended by integral color manufacturer.
1) Immediately after fresh concrete has been brought to a flat surface, a shiny film of moisture on top surface shall not be permitted to evaporate or as soon as the shiny surface disappears, it shall be restored and maintained until troweling.

2) Maintain surface moisture film as specifically recommended by integral color manufacturer applying evaporation retarder/finishing aids, frequent, light, fine spray applications of water rather than excessive wetting. Adjust extent of water spray in accord with temperature, humidity, and wind conditions.

c. Work concrete flatwork to achieve the following tolerances when measured in accord with ASTM E 1155.

1) Trowel finished surfaces: FF25/FL20 with minimum FF20/FL15.

2) Float and broom finished surfaces: FF20/FL17 with minimum FF15/FL10.

d. Surface finish textures:

1) Provide float, trowel, brush/broom, and/or abrasive-blasted surface textures to match Architect-approved sample panels.

2) Perform slip resistance testing to ensure that slip resistance of exposed concrete walking surface finishes is maintained. Follow testing procedures required for slip resistance testing of mock-up sample panels.

2. Curing: Cure, harden, and seal colored concrete flat slabs with compound(s) recommended by manufacturer of integral color concrete pigments. Curing, hardening, and sealing compound(s) shall not discolor, lighten, darken, stain, or impart other unsightly characteristics to colored concrete and shall be compatible with Owner's maintenance sealer.

B. Dumpster and compactor equipment pads and similar heavy-duty use areas indicated on Drawings: Apply bonding agent as recommended by topping manufacturer. Mix and apply extra heavy-duty, metallic-aggregate topping in accord with manufacturer's recommendations; unless indicated otherwise, provide minimum 1 inch topping thickness.

3.03 CURBS AND GUTTERS

A. Construct concrete curbs, gutters, and other similar structures in accord with SSPWC Section 303-5, except finishing and curing of integral color concrete shall be as specified herein for walks and slabs.

3.04 SITE STRUCTURES

A. Construct light pole foundations, fence post footings and similar structures to conform to requirements of SSPWC Section 303-1, Concrete Structures.

1. Formwork: Conform to SSPWC Section 303-1.3.

2. Placing reinforcing steel: Conform to SSPWC Section 303.17.

3. Placing concrete: Conform to SSPWC Section 303-1.8.

4. Consolidating (mechanically vibrating) concrete: Conform to SSPWC Section 303-1.8.4.

5. Construction joints: Unless indicated otherwise on Drawings, keyed type, conforming to SSPWC Section 303-1.8.6 and as specified herein.

6. Expansion joints: Unless indicated otherwise on Drawings, premolded resilient filler, conforming to SSPWC Sections 303-1.8.6.

7. Form removal: Conform to SSPWC Section 303-1.4.

8. Finishing: Conform to SSPWC Section 303-1.9.

9. Curing: Conform to SSPWC Section 303-1.10.

B. Additionally construct thrust blocks, ductbanks, and similar concrete structures related to other Divisions of work, in accord with requirements specified in applicable Sections and as indicated on Drawings.

3.05 JOINTS

A. Construction (pour) joints:

1. Place construction joints at all breaks in concrete placement lasting more than 1 hour and at color changes.

2. Unless otherwise indicated on Drawings, key construction joints for slabs 6 inches or more in thickness, except at expansion joints.

B. Expansion joints: Construct expansion joints with preformed resilient filler compatible with joint sealant materials, including joint backing, specified in Division 32 Section "Concrete Paving Joint Sealants".

C. Control joints:

1. Place control joints in all exterior flat concrete work, and other locations as indicated on Drawings.

2. Where control joints are not indicated on Drawings, verify specific types and layout with Architect prior to placing concrete. Size and shape of layout is dependent on specific areas, but do not space control joints farther apart than 10 feet o.c. in a square pattern (e.g., if a concrete walk is 4 feet wide, control joint should occur at equal spacing of approximately 4 feet o.c. along length).

3. Control joints may be one of two types, as indicated on Drawings: Saw-cut or hand-tooled.

a. Saw-cut:

1) Use at slabs on grade only. Make saw-cuts 1/8 inch wide. Do not cut through steel bar reinforcing. Depth of all saw-cuts shall not be less than 1/4 of slab thickness.

2) Verify hardness condition of concrete before commencing saw-cutting to ensure that saw will not fret, ravel, or spall edges of cuts nor dislodge aggregate. Use saw-cutting equipment appropriate for the hardness condition of concrete

b. Hand tooled: Make control joints with a "V" shaped jointing tool with rounded edges and a 3/4 inch deep keel.

c. Whether saw-cut or hand-tooled, accurately lay out areas and make control joints straight and true, with clearly defined angles.

4. Construction (pour) joints may be substituted for control joints where specifically approved by Architect.

3.06 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading shock, and vibration.

END OF SECTION

SECTION 32 17 00

PAVEMENT MARKINGS AND BUMPERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pavement markings and concrete bumpers.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 32 Section "Asphalt Concrete Paving".

B. Division 32 Section “Site Concrete Work”.

1.03 QUALITY ASSURANCE

A. Reference specifications and standards.

1. AASHTO: M247 Specification for Glass Beads Used in Traffic Paint.
2. AASHTO: M248 Ready-Mixed White and Yellow Traffic Paints.
3. ASTM: A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM: C 33 Concrete Aggregates.
5. ASTM: C 150 Portland Cement.
6. CALTRANS: Standard Specifications.
7. Fed. Spec.: TT-B-1325C Retro-Reflective Beads (Glass Spheres).
8. Fed. Spec.: TT-P-1952D Waterborne Traffic and Airfield Marking Paint.
9. FHWA: FP-92 Standard Specifications for Construction of Roads and Bridges for Federal Highway Projects.
10. SSPWC: Standard Specifications for Public Works Construction.

1.04 SUBMITTALS

A. Procedure: In accordance with Division 01 Sections.

B. Samples: Minimum 4 inches by 12 inches of pavement marking tape.

C. Shop drawings: Scaled plan drawings of pavement marking layouts for approval prior to pavement marking application; include alphanumeric sequential identification, as indicated on Drawings or as directed by Owner, on pavement parking spaces and/or precast wheel bumpers.

D. Product data: Manufacturer's detailed technical materials and application data, including technical bulletins, guides, and manuals, as applicable to the work of this Project, for the following.

1. Pavement marking tape.
2. Pavement marking paint.
3. Reflective glass beads.

1.05 PROJECT CONDITIONS

A. Environmental requirements:

1. Pavement marking paint: Do not apply when ambient or surface temperatures are less than 50°F.

B. Protection: Protect completed application/installation from damage of subsequent construction activities.

C. Sequencing/scheduling:

1. Coordinate and sequence the application/installation of work of this Section with adjacent/integral materials, and work specified in other Sections. Such work includes, but is not limited to, the following:

a. Asphalt concrete paving.

b. Portland cement concrete paving and curbs.

2. Order specified materials, prefabricated work and similar items with extended "long lead" (ordering) times, sufficiently in advance of scheduled application/installation dates to not delay scheduled progress of the Work. Such items include, but are not limited to, the following:

a. Items of rare ("short") supply.

b. Items of nonstandard or custom fabrication/production.

c. Items with nonstandard, optional or custom colors/finishes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. As specifically listed under Materials or as listed in the State of California Department of Transportation Qualified Products List.

1. Centerline Industries, Inc., Ennis, TX 75119. Tel: (972) 875-8661.

2. Franklin Paint Co., Inc., Franklin, MA 02038. Tel: (508) 528-0303.

3. Morton International, Inc., Traffic Markings, Los Angeles, CA 90033. Tel: (213) 225 4154.

4. The Sherwin-Williams Company, Cleveland, OH 44101.

5. 3M Traffic Control Materials Division, St. Paul, MN 55133.

2.02 MATERIALS

A. General: Conform to CALTRANS Section 84, FHWA FP-92, SSPWC Section 210-1.6, and/or as specified herein.

B. Pavement marking paint:

1. Centerline Industries, Inc.

a. White: CL-5042.

b. Yellow: CL-5043.

c. Blue: WX51BLUE.

d. Red: WX51RED.

2. Franklin Paint Co. Inc.
    a. White: 2014 or 2020.
    b. Yellow: 2015.
    c. Blue: 2024.
    d. Red: 20255.
3. Morton International, Inc.
    a. White: 2675A9 or 2675A2.
    b. Yellow: 2676A9 or 2676A2.
    c. Blue: 2678A9.
    d. Red: 2680A9.
4. Sherwin-Williams:
    a. White: TM2152, TM226, TM2116, TM2160, or TM2136.
    b. Yellow: TM2153, TM225, TM2119, TM2161, or TM2155.
    c. Blue: TM2133.
    d. Red: TM2132.
5. Equivalent lead (or similar "heavy" metals)-free, alkyd resin types conforming to AASHTO M248, Type F (fast-dry), Type N (normal-dry), Type S (slow-dry), as appropriate for application conditions, equivalent acrylic resin types conforming to Fed. Spec. TT-P-1952D, or as listed in State of California Department of Transportation Qualified Products List. Provide specific types, as applicable, for specific conditions of application (e.g., high humidity, low surface temperatures, and similar environmental conditions).

C. Reflective glass beads: Conform to CALTRANS Specification 8010-21C-22, or Fed. Spec. TT-B-1325C.

D. Precast concrete bumpers: 3000 psi precast concrete with chamfered edges, and openings for anchoring pins. Provide with smooth finish, free from pits and rock pockets.
    1. Cement: ASTM C 150, Type I or II.
    2. Aggregates: ASTM C 33.
    3. Reinforcing steel: ASTM A 615, Grade 40. Two No. 3 bars minimum, full length or bumper, spaced one each side of anchoring pin openings.
    4. Anchoring pins: Hot-dip galvanized standard weight steel pipe, solid rod, or reinforcing bar, 3/4 inch diameter, 24 inches long.
    5. Concrete stain for marking precast concrete bumpers: H&C Stains, Cleveland, OH. Tel: (216) 566-2000. Color(s) as selected by Owner.
    6. Calking compound: As specified in Division 32 Section "Concrete Paving Joint Sealants".

PART 3 - EXECUTION

3.01 PAINT MARKINGS APPLICATION

A. Apply marking paint in accord with SSPWC Section 310-5.6, CALTRANS Section 84-3, or FHWA FP-92 Section 718.

B. Machine apply paint at the minimum rate as recommended by manufacturer, but not less than the following:

1. 15 mils wet film thickness per coat,
2. 6 mils dry film thickness per coat,
3. 300 feet per gallon per coat of 4-inch solid line (or equivalent rate for broken/skip lines).
4. 17 gallons per mile per coat of 4-inch solid line (or equivalent rate for broken/skip lines).

C. Apply traffic line markings 4 inch wide, unless otherwise indicated on Drawings.

D. Apply multiple coats as required for complete opacity, but not less than two coats. Apply second or final coat immediately prior to completion and acceptance of project.

3.02 REFLECTIVE GLASS BEADS APPLICATION

A. Apply reflective glass beads in accord with requirements of SSPWC Section 210-1.6.5, CALTRANS Section 84-3, or FHWA FP-92 Section 718.

B. Immediately after applying second or final coat of marking paint, apply glass beads at the minimum rate as recommended by manufacturer, but not less than 6 pounds per gallon of marking paint applied.

3.03 PRECAST CONCRETE BUMPERS

A. Drive anchoring pins full depth and recess 1/2 inch below top surface of precast concrete bumper. Fill with calking flush to top of bumper.

B. Mark appropriate lettering on precast concrete bumpers using stencils and specified concrete stain.

END OF SECTION

SECTION 32 1719
PAVEMENT MARKINGS AND WHEEL STOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pavement markings.
2. Wheel stops.
3. Accessible parking signs.
4. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the pavement marking or paving accessory manufacturer, as the context admits, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples: Submit 8-1/2-inch by 11-inch drawdown cards of each specified pavement marking color and sheen. Label each card with project location.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished paving specialties.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Paving specialties must be obtained through one source from the same manufacturer (to ensure compatibility and a uniform appearance).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Accessible parking spaces serving a particular building or facility must be located on the shortest accessible route to an entrance complying with California Building Code Section 11B-206.4.
2. Accessible parking spaces serving more than one accessible entrance must be dispersed and located on the shortest accessible route to the accessible entrances.
3. Accessible parking spaces in a parking facility not serving a particular building or facility must be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. California Building Code Section 11B-208.3.1.
4. Minimum number of required accessible parking spaces must be provided in accordance with California Building Code Table 11B-208.2 for each parking facility provided on a site.
5. For every six or fraction of six accessible parking spaces, at least one must be an accessible van parking space. California Building Code Section 11B-208.2.4.

6. Accessible parking spaces and access aisles must conform to the requirements of California Building Code Section 11B-502 and must be dimensioned to the centerline of the marked lines as follows:
    a. Parking spaces and access aisles must be marked according to California Building Code Figures 11B-502.2, 11B-502.3, and 11B-502.3.3. Their surfaces must conform to the requirements of California Building Code Section 11B-302 and must be at the same level with slopes not steeper than 1:48 in any direction. California Building Code Section 11B-502.4.
    b. Parking spaces must be 9'x18' minimum and van parking spaces must be 12'x18' minimum with an adjacent access aisle of 5'x18' minimum. Access aisles must be placed on either side of the parking spaces except be located on the passenger side for van parking spaces. Van parking spaces must be permitted to be 9 feet by 18 feet minimum where the access aisle is 8 feet by 18 feet minimum.
    c. Access aisles must be marked by a blue painted borderline around their perimeter. The area within the blue borderlines must be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface, preferably blue or white.
    d. Access aisle markings may extend beyond the minimum required length. California Building Code Section 11B-502.3.3.
    e. Access aisles (accessible parking spaces as well - similar application) must not overlap the vehicular way. California Building Code Section 11B-502.3.4.
    f. A vertical clearance of 8 feet-2 inches minimum must be provided for accessible parking spaces, access aisles, and vehicular routes serving them. California Building Code Section 11B-502.
7. At least one passenger loading zone must be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with California Building Code Sections 11B-209 and 11B-503 as follows:
    a. Vehicle pull-up spaces must be 8 feet by 20 feet minimum.
    b. Access aisles must be 5 feet wide minimum x full length of vehicle pull-up spaces they serve and must be adjacent and parallel to the vehicle pull-up spaces. They must be at the same level with each other and with slopes not steeper than 1:48 in any direction. Access aisle must adjoin an accessible route and must not overlap the vehicular way.

c. Access aisles for passenger drop-off and loading zone must be marked with a painted borderline around their perimeter. The area within the borderlines must be marked with hatched lines a maximum of 36 inches on center in a color contrasting with that of the aisle surface. California Building Code Section 11B-503.3.3.

d. A vertical clearance of 9 feet-6 inches minimum must be provided for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. California Building Code Section 11B-503.5.

8. Bus loading zones and bus stops must conform to the requirements of California Building Code Sections 11B-209 and 11B-810.2 as follows:

a. Bus boarding and alighting areas must be of 8 feet by 5 feet minimum, with 8 feet measured perpendicular to the curb or vehicle roadway edge, and with 5' measured parallel to the vehicle roadway. Slopes in 8' direction must be 1:48 maximum. Slopes in 5 -foot direction must be the same as that of the roadway, to the maximum extent practicable. California Building Code Figure 11B-810.2.2.

b. Bus shelters must provide a minimum 30 inches by 48 inches clear floor or ground space (36 inches by 48 inches or 36 inches by 60 inches in an alcove per California Building Code 11B-305.7), with slopes not steeper than 1:48 in any direction, entirely within the shelter complying with California Building Code Section 11B-305.

c. Bus shelters must be connected by an accessible route complying with California Building Code Section 11B-402 to a boarding and alighting area complying with California Building Code Section 11B-810.2 and Figure 11B-810.3.

d. Newly constructed bus stop boarding and alighting areas must provide a detectable transition between the boarding/alighting area and the roadway; the detectable transition must consist of a curb with the face sloped at 35 degrees maximum from vertical or detectable warnings complying with California Building Code Sections 11B-705.1.1 and 11B-705.1.2.4.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.

2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.

3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective paving specialties with undamaged new paving specialties that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKINGS

A. Description: 100-percent water-based acrylic coating used for exterior zone and parking line marking without reflecting glass beads broadcast over the surface.

B. Products: "DURASHEEN Waterborne Traffic Paint" manufactured by Ennis-Flint, or equal.

C. Requisite Properties:

1. Parking Stalls: Single 4-inch wide lines, unless otherwise indicated. Match Federal Standard 595B color FS 27925 (safety white).
2. Lettering, Arrows, and Traffic Signage: Match Federal Standard 595B color FS 27925 (safety white).
3. Accessibility Markings: Single 4-inch wide blue lines, unless otherwise indicated. Match Federal Standard 595B color FS 15092 (blue).
4. Fire Lanes: Red painted curb top and face; or if there is no curb, then paint a 6-inch wide stripe, unless otherwise indicated. Match Federal Standard 595B color FS 11310 (safety red). Paint 4-inch high stenciled letters on curb tops and faces, or on stripes, as applicable, spaced at 20 feet on center.
   a. Stenciled Letter Color: Match Federal Standard 595B color FS 27925 (safety white).
   b. Stenciled Letter Font: 288-Point Linotype Helvetica Neue 85 Heavy.
   c. Stenciled Letter Copy: "FIRE LANE - NO PARKING".

5. Loading Zones: Yellow painted curb top and face; or if there is no curb, then paint a 6-inch wide stripe, unless otherwise indicated. Match Federal Standard 595B color FS 13591 (safety yellow). Paint 4-inch high stenciled letters on curb tops and faces, or on stripes, as applicable, spaced at 20 feet on center.
    a. Stenciled Letter Color: Match Federal Standard 595B color FS 17038 (black).
    b. Stenciled Letter Font: 288-Point Linotype Helvetica Neue 85 Heavy.
    c. Stenciled Letter Copy: “LOADING ZONE - NO PARKING”.
6. Temporary Parking: Green painted curb top and face; or if there is no curb, then paint a 6-inch wide stripe, unless otherwise indicated. Match Federal Standard 595B color FS 14109 (safety green). Paint 4-inch high stenciled letters on curb tops and faces, or on stripes, as applicable, spaced at 20 feet on center.
    a. Stenciled Letter Color: Match Federal Standard 595B color FS 27925 (safety white).
    b. Stenciled Letter Font: 288-Point Linotype Helvetica Neue 85 Heavy.
    c. Stenciled Letter Copy: “TEMPORARY PARKING - 20 MINUTES”.

2.2 WHEEL STOPS

A. Precast Concrete Wheel Stops: Standard precast concrete units cast from at least 4,000 pounds per square inch concrete reinforced with at least two No. 3 deformed steel reinforcing bars. Precast units must have smooth and dense surfaces free of honeycombs.

B. Adhesive:
    1. Description: 2-component, 100-percent solids, moisture-tolerant, high modulus, high strength, structural epoxy adhesive conforming to both ASTM C 881 and AASHTO M-235 requirements for epoxy resin adhesives.
    2. Product: “Sikadur 32 Hi-Mod” manufactured by Sika Corp., or equal.

2.3 ACCESSIBLE PARKING SIGNAGE

A. Signs:
    1. Products: Provide products manufactured by STOPSignsAndMore.com, or equal.
        a. Van Accessible Parking Signage: “R99-C-MOD” California disabled parking van accessible combo signs with sun-weather-graffiti protection.
        b. Other Accessible Parking Signage: “R99-C (CA)” California disabled parking signs with sun-weather-graffiti protection.

2. Requisite Properties:
    a. Size: 12 by 24-inches.
    b. Base Material: 0.063-inch thick (USSG 14) 5052-H32 aluminum bare sheet with PVC on one side and conforming to ASTM B 209.
3. Sign Material:
    a. Description: Microprismatic reflective sheeting with pressure-sensitive adhesive backing conforming to ASTM D 4956 Type I requirements, with Class-1 adhesive.
    b. Products: “Engineer Grade Prismatic Reflective Sheeting Series 3430” manufactured by 3M, or equal.
    c. Protective Film: “Premium Protective Overlay Film Series 1160” manufactured by 3M, or equal.
4. Corner Condition: Radiused.
5. Mounting: Furnish with holes drilled at the top and bottom centers.

B. Sign Posts:
1. Description: 52-inch high bollard/8-foot high signpost assembly that springs back into place after being hit by a vehicle.
2. Product: “Flexible Bollard Signpost Systems - Handicapped Parking” manufactured by Emedco, or equal.
3. Requisite Properties: Provide blue bollard with reflective white tape, without sign.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.5 MIXING

A. Factory-mix pavement marking paint to match approved samples and mockups accepted by the Architect.

B. Box paint at the project site or factory-batch to ensure uniform and consistent color. This requirement includes specified maintenance materials.

C. Open paint containers only as required for use and mix only in designated areas.

D. Thoroughly agitate and stir materials to a uniform and smooth consistency suitable for proper installation.

E. Do not reduce, alter, or introduce foreign materials into paint, except in conformance with manufacturer’s instructions and other requirements and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install pavement markings and paving specialties using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Only install pavement markings under conditions that ensure finishes are free from blemishes and defects.
   a. Provide smooth pavement marking surfaces of uniform finish, color, appearance, and coverage. Pavement markings with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
   b. Do not exceed the application rates recommended by the manufacturer.
3. Installed pavement markings must be warrantable. Do not install, correct, or replace paving markings in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach paving specialties to supporting construction.

C. Installation Tolerances: Install paving specialties to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed paving specialties in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed paving specialties unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed paving specialties as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 1726
TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Detectable warning surfacing tile.
2. Installation materials.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the tactile surfacing manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data:
   a. Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   b. Submit sample warranties with warranty periods, terms, conditions, exclusions, and remedies explicitly defined for each warranty, including clear warranty period start dates. (e.g., date of manufacture, purchase, installation, Beneficial Occupancy, Substantial Completion, Final Completion, etc.)
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Samples: Submit at least 10-inch square representative samples of each tactile surfacing color, finish, and variety.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).
   1. Submit manufacturer-prepared published instructions for proper installation of furnished tactile surfacing.
   2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
   3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

C. Closeout Submittals: Submit the following to the Architect as a condition of project closeout.
   1. Warranty Documentation: Submit final warranties signed by the manufacturer's representative with complete terms indicated for all warranties covering items furnished or installed under this specification section.

D. Maintenance Material Submittals: Before Final Completion, deliver to the Owner tactile surfacing cleaning materials, equipment, accessories, and instructions; and extra stock materials to replace those worn or damaged as a result of normal occupancy.
   1. Furnish at least 2 percent of the total installed for each tile tactile surfacing, color, composition, and variety.
   2. Furnish at least 2 percent of the total amount installed for each installation material type, color, and composition. but not less than one unopened container.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Tactile surfacing must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

B. Regulatory Requirements:

1. Tactile surfacing must conform to the requirements of California Building Code Section 11B-705.1.
2. Tactile surfacing at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings must be yellow and approximate Federal Standard 595C color FS 33538 (orange yellow). Tactile surfacing at other locations must be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of adjacent walking surfaces. The material used to provide visual contrast must be an integral part of the surface. California Building Code Section 11B-705.1.1.3.
3. Detectable warning surfaces must differ from adjoining surfaces in resiliency or sound-on-cane contact. This requirements is not required for detectable warning surfaces at curb ramps, islands, or cut-through medians. California Building Code Section 11B-705.1.1.4.
4. Provide 5-year minimum warranty per DSA Bulletin 10/31/02, revised 04/09/08.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer’s instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective tactile surfacing with undamaged new tactile surfacing that does not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

1.6 WARRANTY

A. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects, and incipient and catastrophic failure for 10 years.

PART 2 - PRODUCTS

2.1 DETECTABLE WARNING SURFACING TILE

A. Description: Vitrified polymer composite (VPC) detectable warning tactile surfacing tiles consisting of an epoxy polymer resin with aluminum oxide particles cast into truncated domes.

B. Manufacturers: Provide products manufactured by one of the following, or equal.

   1. Engineered Plastics, Inc.
   2. ADA Solutions Inc.

C. Products: “Armor-Tile Tactile Systems” manufactured by Engineered Plastics, Inc., or equal.

   1. Cast-in-Place Tiles: “ADA-C-2424”, or equal.
   2. Surface-Applied Tiles: “ADA-S-2424”, or equal.

D. Requisite Properties:

   1. Size: 24 inches square.
   2. Color: Match Federal Standard 595B color FS 13637. (yellow)
   3. Adhesive: “Tactile Bond & Seal”, or equal, moisture cured, flexible, silicone free, rubber based, dual purpose adhesive and sealant.

2.2 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install tactile surfacing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, level and square without warp, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed tactile surfacing must be warrantable. Do not install, correct, or replace tactile surfacing in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach tactile surfacing to supporting construction.

C. Installation Tolerances: Install tactile surfacing to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed tactile surfacing in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed tactile surfacing unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed tactile surfacing as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 3119
FABRICATED DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-fabricated decorative fences and gates.
   2. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

B. Related Requirements:
   1. Section 05 50 10 for dissimilar metal corrosion protection.

1.2 REFERENCES

A. Abbreviations and Acronyms:
   1. AWS: American Welding Society.
   2. DFT: Dry Film Thickness.
   3. HDG: Hot-Dip Galvanized.
   4. SSPC: The Society for Protective Coatings.

B. Definitions:
   1. Manufacturer: Means the fencing and gate fabricator, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).
   1. Product Data:
      a. For manufactured items, submit manufacturer's product data, specifications, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs), and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
   2. Shop Drawings:
      a. Submit dimensioned plans and elevations drawn to scale and showing fence and gate layout and types. Show locations, sizes, and extents of all items, accessories, and trim. Label manufactured items by product name.

b. Include project-specific dimensioned details drawn to scale showing profiles, shapes, joints, seams, and dimensions, including coves, miters, and corner conditions. Cross-reference details to plans and elevations.
c. Indicate method of attaching, fastening, joining, adhering, and anchoring to adjacent construction.
d. Show backings, embedments, fasteners, brackets, clips, cleats, straps, mounting devices, and other attachments.
e. Label each attachment type; indicate manufacturer's product name for each manufactured item.
f. Indicate base material and finish, fastener material and finish, and material and finish of items being fastened or attached.
g. Label welds in conformance with the requirements of AWS publication A2.4, "*Standard Symbols for Welding, Brazing, and Nondestructive Examination*".

B. Informational Submittals: Submit written descriptions confirming experience specified in QUALITY ASSURANCE article below for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1.4 QUALITY ASSURANCE

A. Quality Standard:
1. Design Standard for Galvanized Items: Items indicated as galvanized must be designed and fabricated in conformance with the requirements of AGA publication, "*The Design of Products to be Hot-Dip Galvanized after Fabrication"*, and ASTM A 385. Limit the use of vent and drain holes and locate where they drain by gravity and are concealed from view in the finish work.
2. Welding Standards: Welding procedures must conform to the requirements of the following American Welding Society publications.
a. AWS D1.1, "*Structural Welding Code – Steel*".
b. AWS D1.3, "*Structural Welding Code – Sheet Steel*".
c. AWS D19.0, "*Welding Zinc Coated Steel*".

B. Qualifications:
1. Fabricator: Company or individuals must have experience fabricating fences and gates similar to this project in size, material, design, and complexity
2. Installer: Company or individuals must have experience installing fences and gates for projects similar to this project in size, material, design, and complexity.

3. Welders: Welding personnel and supervisors must comply with the "*Qualification*" requirements of AWS quality standard publications. Only certified welders current in their certification may perform or supervise any welding work.
4. Supervisors: Individuals must have experience installing fences and gates for projects similar to this project in size, material, design, and complexity,

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items as shipped. Furnish adequate dunnage and bracing during storage.
   1. Prevent stored items from contacting the floor or ground, from soiling and staining, and from deterioration and damage.
   2. If items are not stored in an enclosed location, then cover the tops and sides with securely-tied, waterproof, and breathable covers. Unvented polyethylene tarpaulins do not qualify as breathable covers and are prohibited. (due to potential accumulation of moisture beneath tarpaulin during certain environmental conditions)
   3. Incline covered items to ensure maximum drainage of accumulated moisture.
   4. Do not leave items uncovered where they might be exposed to weather or become wet from rain, mist, relative humidity, condensation, frost, and other sources of moisture; or exposed to other sources of deterioration and damage.
C. Handling: Handle items in a manner that that prevents damage.
D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective fence and gate components with undamaged new fence and gate components that do not exhibit deterioration, damage, or defects.
E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 FENCES AND GATES

A. Posts and Rails: Indicated on the Drawings.

B. Infill: Indicated on the Drawings.

2.2 MATERIALS

A. Steel:

1. Steel Plate: ASTM A 36 (mild steel).
2. Hot-Rolled Steel Rods, Bars, and Shapes: ASTM A 36 (mild steel), merchant quality.
3. Steel Structural Tubing: ASTM A 500, Grade A, black, round or shaped hot-formed tubing as indicated, outside diameter or dimensions as indicated, and calculated wall thickness as required by engineering calculations for type of use indicated. Provide seamless tubing.
4. Mechanical Tubing: ASTM A 513, black, Type 5 M.D. (mandrel drawn or Drawn over a Mandrel).

2.3 ACCESSORIES

A. Fastenings: Provide backings, inserts, loose connection hardware, fasteners, anchors, attachments, connectors, and other items supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

B. Flanges and Anchors: Unless otherwise indicated, provide cast or formed metal of the same type, material, and finish as the supported metal fabrications.

C. Grout:

1. Description: Pre-packaged, non-shrink, non-metallic, non-corrosive, non-staining, non-gaseous grout conforming to ASTM C 1107, Grade A (drypack) and Grades B and C (flowable grout) of a consistency suitable for application within a 30-minute working time.
2. Type: Grout specifically recommended by the manufacturer for interior and exterior applications.
3. Minimum 28-day Compressive Strength: At least 7,500 pounds per square inch.

D. Other Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

2.4 FABRICATION

A. Shop Fabrication:

1. Fabricate items in largest sections practicable to minimize field jointing.

2. Fabricate exposed work precise, straight, and true to line, size, and shape; plumb, level, and square within allowable tolerances; and with accurate angles and surfaces, and crisp straight edges.
3. Fabricate exposed connections with flush hairline joints, and square and true edges and corners.
4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.
5. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.
6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
7. Cut, reinforce, drill, punch, thread, and tap fences and gates as necessary to receive other fabrications, components, accessories, hardware, and similar items, and as required to securely attach to supporting construction
8. Before cleaning, treating, and applying specified finishes, remove blemishes by grinding.
9. Remove sharp or rough areas on exposed traffic surfaces. Ease exposed edges to a nominal 1/32-inch radius.

B. Welded Joint Finish Appearance: NOMMA Finish #2. (completely sanded joint, some undercutting and pinholes okay)

C. Fabrication Tolerances: Fabricated items must conform to the following; specified tolerances are non-cumulative.

1. Squareness: Not more than 1/8-inch difference in diagonal measurements.
2. Maximum Offset between Components at Joints: 1/16-inch except that at welded joints, offset are prohibited.
3. Maximum Misalignment of Adjacent Members: 1/16-inch.
4. Maximum Bow: 1/8-inch in 48 inches.
5. Maximum Deviation from Plane: 1/16-inch in 48 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify that in-place construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the fabricator's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 PREPARATION

A. Dissimilar Metal Corrosion Protection: Prevent galvanic action by permanently isolating metal surfaces from direct contact with more noble or cationic metals, incompatible materials, and other potentially corrosive surfaces in conformance with Section 05 50 10.

3.3 INSTALLATION

A. General Requirements:

1. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for fence and gate installation.
2. Set fences and gates true to line, to required levels and lines, plumb, square, and cut and fitted without warp or rack; sloped or level as required; with flush well-fitted joints; and in alignment with adjacent construction.
3. Shim as required with concealed shims.
4. Dry-pack fences and gates supported on concrete and masonry to provide firm, level bearing surfaces.
5. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.
6. Fit exposed connections accurately to form flush hairline joints

B. Special Techniques:

1. Adjust fences and gates before anchoring to ensure matching alignment at abutting joints.
2. Space posts at spacing indicated or, if not indicated, as required by design loads.

3. Plumb posts in each direction.
4. Secure posts and rail ends by welding directly to steel supporting members.

C. Interface with Adjacent Items:
1. Attachment: Provide materials, components, and accessories normally furnished or necessary to securely attach fences and gates to supporting construction.
2. Field Welding:
a. Comply with AWS quality standard publications for manual shielded arc welding procedures, appearance and quality of welds, and methods to correct faulty welds.
b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
c. Before welding, grind to remove zinc coating from one to 4 inches from either side of the intended weld zone and on both sides of the item.
d. Obtain fusion without undercut or overlap.
e. Promptly remove welding flux.
f. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
g. Do not weld, cut, or abrade exterior surfaces hot-dip galvanized after fabrication and are for bolted or screwed field connections.
h. Field-weld connections indicated as exposed joints but cannot be shop-welded because of shipping size limitations.
i. Welds remaining exposed must be ground smooth and flush to match and blend with parent metal surfaces.
j. Clean field welds, weld spatter, bolted connections, and abraded areas promptly after installation.

D. Installation Tolerances: Install fences and gates to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch and from plumb, level, and alignment.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include
   1. written descriptions of non-conforming, damaged, and defective work;
   2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
   3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.
C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.
D. Damaged Primer Touchup: Clean and prepare damaged primed surfaces in conformance with manufacturer's published instructions and SSPC surface preparation standard SSPC-SP11 "*Power Tool Cleaning to Bare Metal*".
   1. Sand smooth and re-clean.
   2. Spot-prime bare metal surfaces with specified primer applied to a total spot primer DFT of at least 5 mils.
   3. Overlap undamaged primer areas with spot primer at least 2 inches.
E. Damaged Galvanizing Touchup: Repair damaged galvanized items or re-galvanize items that cannot be satisfactorily repaired to the Architect's acceptance.
   1. Zinc-Based Solder Repair: Repair damaged galvanizing in conformance with ASTM A 780 Annex A1.
   2. Organic Zinc-Rich Cold Galvanizing Compound Repair:
      a. Repair damaged galvanizing in conformance with ASTM A 780 Annex A2
      b. Apply cold galvanizing repair compound to a DFT of 1.5 plus or minus 0.5 mils per coat, when measured in conformance with SSPC publication SSPC-PA 2, "*Determining Compliance to Required DFT*". Provide 2 coats.

3.5 CLEANING

A. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.6 PROTECTION

A. Protect installed fences and gates in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything adjacent to or against installed fences and gates unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed fences and gates as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 3143
AUTOMATIC GATE OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Swing gate operators.
2. Vehicle loop detectors.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the gate operator manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.
3. Wiring Diagrams: Submit wiring diagrams for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring; and between components furnished by the manufacturer and those indicated in other specification sections.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished gate operators.

2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Gate operators must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
      a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
      b. Items provided for each different installation must be obtained from the same source and manufacturer.
   2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.
B. Quality Standard: Gate operators and accessories must conform to the requirements of UL 325, "*Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems*".

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.
   1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
   2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
   3. Unload and store only inspected and accepted items.
B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.
C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective gate operators with undamaged new gate operators that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.

1. Ameristar Perimeter Security.
2. The Chamberlain Group, Inc.
3. HySecurity.
4. LiftMaster.
5. Tymetal Corp.

2.2 SWING GATE OPERATORS

A. Description: Commercial pad mount electromechanical vehicular swing gate operator conforming to UL 325 requirements for Class II operators (commercial/general access vehicular gate operator), with UPS extended battery backup for gate travel after AC power loss.

1. Class I - Residential Vehicular Gate Operator: Vehicular gate operator (or system) intended for use in a home of one to four single family dwellings, or garage or parking area associated therewith.
2. Class II - Commercial/General Access Vehicular Gate Operator: Vehicular gate operator (or system) intended for use in a commercial location or building such as a multi-family housing unit (five or more single family units, hotel, garages, retail store or other building servicing the general public.
3. Class III - Industrial /Limited Access Vehicular Gate Operator: Vehicular gate operator (or system) intended for use in an industrial location or building such as a factory or loading dock area or other locations not intended to service the general public.
4. Class IV - Restricted Access Vehicular Gate Operator: Vehicular gate operator (or system) intended for use in a guarded industrial location or building such as an airport security area or other restricted access location not servicing the general public, in which unauthorized access is prevented via supervisions by security personnel.

B. Product: “CSW200UL Swing Gate Operator” manufactured by LiftMaster, or equal.

C. Requisite Properties:

1. Maximum Gate Weight/Length:
   a. 1/2 HP: 600 pounds, 20 feet.
   b. 1 HP: 1,000 pounds for 22-feet.
2. Minimum Gate Travel Speed: Between 20 seconds.

2.3 CONTROLS AND DETECTORS

A. Controller: “Security+ 2.0” manufactured by LiftMaster, or equal.

B. Vehicle Loop Detectors: “Plug In Loop Detector-LOOPDETLM” manufactured by LiftMaster, or equal.

C. Entrapment Zone Sensors and Contact Sensors (Edge Detectors): Manufacturer’s standard conforming to UL 325 requirements for Class II operators.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer’s requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer’s instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install gate operators using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed gate operators must be warrantable. Do not install, correct, or replace gate operators in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach gate operators to supporting construction and to safely connect facility services.

C. Installation Tolerances: Install gate operators to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 ADJUSTING

A. Verify smooth and quiet gate operator door and hardware operation.

B. Lubricate and adjust operating parts and hardware to function properly, free from warp, twist, binding, and distortion. Confirm latches and locks engage securely without forcing or binding.

C. Replace items that do not operate freely in a safe and reliable manner.

3.4 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.5 PROTECTION

A. Protect installed gate operators in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed gate operators unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed gate operators as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration:

1. Engage a factory-authorized service representative to perform startup services and train maintenance personnel.
2. Demonstrate the successful operation of each overhead door for 3 consecutive complete opening and closing cycles.

END OF SECTION

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SECTION 32 3913
MANUFACTURED METAL BOLLARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Utilitarian steel bollards.
2. Decorative metal bollards.
3. Supplementary components and accessories normally furnished or necessary for a complete installation, whether or not such items are indicated on the Drawings or included in the Specifications.

1.2 REFERENCES

A. Definitions:

1. Manufacturer: Means the bollard manufacturer, unless otherwise indicated.

1.3 SUBMITTALS

A. Action Submittals: Submit the following for responsive action (formal review and approval).

1. Product Data: Submit manufacturer's product data, specifications, typical installation details, and all other information necessary to show conformance to the Contract Documents, excluding material safety data sheets (MSDSs) and safety data sheets (SDSs), both of which are returned to the Contractor without review or responsive action.
2. Shop Drawings: Include project-specific dimensioned details drawn to scale showing conditions not detailed on the product data; or that are detailed, but not in a manner specific to the project.

B. Informational Submittals: Submit manufacturer's instructions for information (informal review: responsive action not expected or required, except to record non-conformance with submittal requirements).

1. Submit manufacturer-prepared published instructions for proper installation of furnished bollards.
2. If manufacturer's instructions are unavailable or do not apply to specific project conditions, then consult the manufacturer's representative and obtain project-specific supplemental instructions printed on manufacturer's letterhead.
3. Promptly distribute supplemental instructions to the Architect, who may have comments that lead to contract modifications or minor changes in the work.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Bollards must be obtained through one source from the same manufacturer (to ensure compatibility, regulatory conformance, and a warrantable installation).
   a. Certain items may be obtained from more than one manufacturer, but only when used for separate installations.
   b. Items provided for each different installation must be obtained from the same source and manufacturer.
2. Provide secondary materials, components, accessories and other items from sources required, recommended, or accepted by the primary manufacturer for actual in-service conditions applicable to the project.

1.5 HANDLING

A. Receiving: Inspect all deliveries for deteriorated, damaged, and defective items.

1. Reject items that are not packaged in a manner that prevents damage; or that exhibit deterioration or damage or have damaged or open packaging or containers.
2. Reject items that are not transported, delivered, or protected in conformance with manufacturer-recommended transport, delivery, and receiving requirements.
3. Unload and store only inspected and accepted items.

B. Storage: Store unloaded items indoors as shipped, upright in their original packaging or containers, within dry, well-ventilated, broom-cleaned and enclosed storage areas.

C. Handling: Handle items in conformance with manufacturer's instructions and other requirements and recommendations, and in a manner that that prevents damage. Avoid damage to packaging and containers, and contamination of contents.

D. Damaged Item Replacement: Promptly remove and replace deteriorated, damaged, or defective bollards with undamaged new bollards that do not exhibit deterioration, damage, or defects.

E. Packaging Waste Management: Do not burn or bury construction waste at the project site. Remove and legally dispose of all construction waste away from the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Calpipe Security Bollards.
   2. Encore Commercial Products, Inc.
   3. ULINE.

2.2 UTILITARIAN STEEL BOLLARDS

A. Description: Heavy-duty steel bollard posts have removable black caps. Fill with concrete for extra strength.
B. Products: “Model No. H-4971F” manufactured by ULINE, or equal.
C. Requisite Properties:
   1. Diameter: 5.5 inches.
   2. Nominal Top: Flat.
   3. Overall Length: 42 inches.
   4. Mounting Plate: 8 inches square.

2.3 DECORATIVE METAL BOLLARDS

A. Description: Medium sectainless steel fixed post security bollards.
B. Products: Provide the following manufactured by Calpipe Security Bollards, or equal.
   1. Carbon Steel Bollards: “Item No. IBF06040”, or equal.
   2. Stainless Steel Bollards: “Item No. SSF06040”, or equal.
C. Requisite Properties:
   1. Material: Stainless steel #4 finish.
   2. Nominal Diameter: 6 inches.
   3. Top: Flat.
   4. Overall Length: 48 inches.
   5. Embedded Length: 12 inches.
   6. Height Above Finish Flooring: 36 inches.

2.4 ACCESSORIES

A. Accessories: Provide accessories and secondary items normally furnished or necessary for a complete installation; or supplied, required, recommended, or accepted by the manufacturer for actual in-service conditions applicable to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Oversight: Ensure an adequate number of supervisors are present and proper supervision practices are followed at the project site before the installer begins work and at all times during installation.

B. Verification: Verify in-place supporting and adjacent construction conforms to the manufacturer's requirements or recommendations and satisfies all other conditions that might affect the quality of installation or the durability, appearance, or performance of installed and adjacent items.

C. Evaluation and Assessment:

1. Identify project conditions that do not conform to the manufacturer's instructions and other requirements and recommendations.
2. Perform or arrange and pay costs without reimbursement from Owner for all remedial work necessary to correct or improve deficient conditions, without limitation, before the installer begins work.

3.2 INSTALLATION

A. General Requirements:

1. Install bollards using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
2. Set items true to line, to required levels and lines, and plumb, level, and square, without warp or rack, with flush well-fitted joints, and in alignment with adjacent construction
3. Installed bollards must be warrantable. Do not install, correct, or replace bollards in a manner that results in any warranty or guarantee becoming void.

B. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to securely attach bollards to supporting construction.

C. Installation Tolerances: Install bollards to an allowable tolerance variation of not more than 1/4-inch from true position and not more than 1/8-inch from plumb, level, and alignment.

3.3 CORRECTION AND REPAIR

A. Non-conforming, damaged, and defective work must be brought into conformance with the Contract Documents. Correct and repair as necessary, without limitation, including arranging all correction and repair work and paying all correction and repair costs without reimbursement from Owner, until accepted in writing by the Architect.

B. Corrective and repair work must be performed in conformance with a correction and repair plan submitted to and accepted in writing by the Architect before correction or repair work begins. At a minimum, correction and repair plans must include

1. written descriptions of non-conforming, damaged, and defective work;
2. supporting sketches, diagrams, photographs, and other visual depictions of non-conforming, damaged, and defective work; and
3. similar written descriptions and visual depictions of Contractor-proposed corrections and repairs.

C. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be corrected or repaired to the Architect's acceptance.

3.4 CLEANING

A. Cleaning Work: Clean all visible bollard surfaces in a manner that does not result in any warranty or guarantee becoming void.

1. Use cleaning materials, equipment, and accessories supplied, and means, methods, techniques, and procedures required, recommended, or accepted by the manufacturer.
2. Do not use cleaning materials or procedures known to change, or that might change, the appearance of exposed finishes or adjacent surfaces; or cause deterioration or damage to exposed finishes or adjacent surfaces.
3. Protect adjacent surfaces not being cleaned from staining, deterioration, damage, or other detrimental effects caused by cleaning.
4. Arrange and pay costs without reimbursement from Owner for removing and replacing work that cannot be cleaned to the Architect's acceptance.

B. Waste Management: After completing the work of this specification section, leave work areas free from debris, waste, scrap, equipment, tools, and other items.

3.5 PROTECTION

A. Protect installed bollards in place from soiling, deterioration, and damage until Substantial Completion.

B. Do not store anything on or adjacent to or against installed bollards unless they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed bollards as work surfaces.

C. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 84 23
IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, Special Conditions and Division 1.

B. Section Includes:

1. Pipe and fittings, sleeves, valves, drip line, and accessories.
2. Connection to new water source and backflow prevention equipment.
3. New irrigation controller and related equipment, and connection to new electrical source.
4. Maintenance of irrigation system for 60 days.

1.02 REFERENCES

A. American Society for Testing and Materials.

1. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
2. ASTM D2564 - Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

1.03 SYSTEM DESCRIPTION

A. Electric solenoid controlled automatic drip irrigation system.

1.04 SUBMITTALS

A. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of drip irrigation systems, plant and landscaping features, site structures, schedule of fittings to be used.

B. Product Data: Provide component and control system and wiring diagrams. Substitutions permitted under the provisions of applicable specification section.

C. Manufacturer's Installation Instructions: Include remote control valves, ball valves, quick coupling valves, and irrigation controller.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of appropriate specification section. Maintain records daily.

B. Accurately record actual locations of main lines, sleeves, valves, and connection points to water meter and electrical source. Utilize dimensions from recognizable references.

C. Install in control cabinet one new/updated reduced plan, color-coded, encased in transparent cover indicating areas covered by each remote control valve in the new irrigation system, and accurate numbering of valves corresponding to controller stations.

1.06 OPERATION AND MAINTENANCE DATA

A. Provide instructions for operation and maintenance of all irrigation system components, and manufacturer's parts catalogues.

1.07 REGULATORY REQUIREMENTS

A. Comply with applicable codes for backflow preventer, piping, and component requirements.

1.08 FIELD MEASUREMENTS

A. Verify that all field measurements are as shown on Drawings; notify Inspector if any field conditions are different from those shown on Drawings prior to making changes or adjustments.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:
   1. Rainbird, Glendora CA.
   2. Hunter Industries, San Marcos, CA.
   3. Superior Controls Co., Torrance CA.
   4. Watts Co., North Andover, MA.
   5. Nibco Scott, Elkhart IN.
   6. Western Plastic Corp., Downey CA.
   7. Lasco, Anaheim CA.

2.02 PIPING

A. PVC Pipe: In accordance with ASTM D2241; 200 psi pressure rated upstream from controls, 160 psi solvent-weld sockets, Schedule 40, identified by manufacturer, NSF approved. All lateral and main Line pipe on the project: Schedule 40 PVC.

B. Air relief valves and flush valves manufactured for use with drip line irrigation system.

C. PVC Fittings: Type and style of connection to match pipe, PVC medium wall, solvent weld.

D. Solvent Cement: ASTM D2564; for use on all PVC pipe and fittings.

E. Sleeve Materials: PVC Schedule 40, 4” diameter size.

F. Pipe Dating: Pipe manufactured more than two years before installation not permitted.

2.03 OUTLETS

A. Flexible Subsurface Irrigation Drip Line: Subsurface irrigation drip line shall be flexible polyethylene plastic, incorporating copper shield technology to discourage root intrusion, and shall be manufactured with factory-installed emitters at 12 inches on center.

B. Quick Coupler: All brass, automatic closing by own weight when coupler is removed.
   1. Quick coupling valves shown near walks, curbs or headers: Locate 12” in from the edge.
   2. Shrubbery Areas: 2 inches above finish grade permanently.
   3. Keys: Same manufacturer as quick coupler, designed to fit specified quick coupler.

2.04 VALVES

A. Ball Valves: Brass construction, minimum 150 lbs cold water working pressure. No other type valves permitted.

B. Remote control drip valve kits: Remote control valves with built-in pressure regulators and filter kits manufactured specifically for use with subsurface drip technology, as listed on the Drawings and Irrigation Legend. All subsurface drip equipment to be produced by the same manufacturer; substitutions are not allowed without written authorization from the Engineer.

C. Remote Control Valve Box and Cover: Plastic with marked lids.

2.05 CONTROLS

A. Controller: New weather-based 18-station irrigation controller and associated onsite weather sensor, manufacturer and model as called out on the drawings. Controller to be connected to new electrical source as shown on the Drawings.

B. Electric Solenoid: Normally closed valves to control wiring, including required fittings and accessories.

C. Wire: Color coded, No. 14 size, direct burial type.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify dimensions. Drawing dimensions are approximate only. Report variations to Inspector before proceeding with work.

C. Verify locations of existing utilities, particularly new and existing water meter(s) and location of new reduced pressure backflow preventer per Civil Engineer's plans, to be point of connection for irrigation system.

D. Verify that required utilities are available in proper location and ready for use.

E. Beginning of installation means installer accepts existing conditions.

3.02 PREPARATION

A. Piping layout indicated is diagrammatic only. Route piping to avoid tree root zones, plants, and structures.

B. Layout and stake locations of system components.

C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

D. Verify location of existing utilities. Protect from damage.

3.03 TRENCHING

A. Minimum Trench Width: Minimum horizontal clearance 8 inches.

B. Minimum Trench Depth:

1. Minimum 18-inch total cover over main lines in planted areas.
2. Minimum 12-inch total cover over lateral lines downstream from control valves in planted areas.
3. Minimum 24-inch cover over mains, laterals and electric wiring in paved areas, sleeved in PVC.
4. Minimum 4-inch cover over subsurface drip line.
5. 3-inch minimum, 8-inch maximum cover over cross arm of control valves in open position.

D. Trenches to accommodate grade changes and slope to drains.

E. Clearances:

1. Minimum 12 inches clear from any irrigation line to lines of other trades running parallel.
2. Minimum 2 inches clear from any irrigation line to lines of other trades running at 45 to 90 degrees.

F. Maintain trenches free of debris, material or obstructions that may damage pipe.

G. Piping indicated on drawings under paved areas but running parallel and adjacent to planted areas: Install in planted areas.

H. Piping installed parallel to and directly over another line not permitted.

3.04 INSTALLATION

A. Install all pipe, valves, controls and outlets in accordance with City codes and manufacturer's instructions.

B. In general, below-grade piping installations, including trenching, placement, testing and backfill, shall take place prior to new construction. Where construction sequencing precludes, provide surface cutting as specified herein.

C. Jacking: Piping under concrete shall be done by jacking, boring or hydraulic driving. Piping under asphalt surfaces shall be done by jacking or boring only.

D. Sitework Cutting: Where trenching requires cutting existing concrete or asphalt surfaces, approval shall be obtained from the Inspector prior to cutting. Areas to be cut and removed shall be marked in advance for review. Use only saw cutting equipment. Replaced materials shall match existing textures, colors and surface characteristics, at no extra cost to City.

E. Connect to new reduced pressure backflow preventer as indicated on the Drawings.

F. Required Levels:

1. Set box covers 1 inch above finish grade in landscape areas.

2. Lay flexible subsurface irrigation drip line in parallel trenches 12" on center, with edge tubing as shown on Drawings. All drip line shall have minimum 4" of clean site soil cover, no rocks 1" diameter or larger.

G. No irrigation emitter or dripline will be permitted to leak water into streets, sidewalks, or other paved areas. Tubing shall be adjusted as necessary to eliminate seepage onto paving.

H. Secure drip line tubing and edging in place with metal "staples" manufactured specifically for this purpose, set at minimum 24" on center.

I. Install one air relief valve at the high point, and one flush valve at the low point, of each drip line remote control zone.

J. Provide for thermal movement of components in system.

K. Install low voltage control wiring. Provide 10-inch expansion coil at each valve to which controls are connected and at 100 feet intervals. Bury wire beside pipe, conduit not required. Mark valves with neoprene valve markers containing locking device. Set valve markers in 160 psi PVC pipe risers exiting from top of valve to finish grade.

1. Provide separate wire from controller to each valve, or as indicated on the drawings. Provide neutral wire from controller to each valve, with white insulation. Color code pilot wires and size in accordance with the drawings.

2. Splicing of wires between controller and valve not permitted except at box.

3. Splicing: SCOTCHLOK or approved equal connector sealing packs. Mix SCOTCHCAST or approved equal resin in UNIPAK container and insert connection into bag.

4. Bundle and tape control wires at 10 feet intervals, full length of run. Use rubber electrical tape or fiberglass tape.

L. Controller installation and programming. Install new controller as specified on the Drawings, connecting to electrical source as shown. Install weather sensor nearby in a location open to weather elements, and wire to controller per manufacturer's instructions, unless wireless weather sensor is used. Connect new remote control valves as required.

M. After piping is installed but before backfilling commences, open valves and flush system with full head of water.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under applicable specification provisions.

B. Pressure Tests, Main Lines: Conduct test after lines have been flushed and before control valves or quick coupling valves are set in place. Trenches shall be dry from flushing procedure. Conduct tests in presence of Inspector.

1. Notify Inspector 24 hours prior to expected time for required services.
2. Cap and pressure test at 125 PSI for a period of two hours. Correct leaks by replacing defective materials; retest as required to achieve specified performance.

3.06 BACKFILLING

A. Backfill trenches and compact to subgrade elevation as specified in grading plans and specifications. Protect piping from displacement. Backfill for non-pressurized lines shall be equal to adjacent undisturbed soil, minimum 85 percent density compaction, all rocks 1" diameter and larger removed.

B. Do not commence backfilling until system has been flushed, tested and approved. Flush lateral lines by removing caps most distant from control valve.

C. Replace work damaged by the work of this Section with equivalent products. Repair damage to grounds, walls, paving, structures, piping systems, electrical systems, equipment or contents caused by leaks or faulty workmanship.

3.07 INSTALLER'S FIELD SERVICES

A. Prepare and start systems.

B. Program controller with appropriate start-up watering cycles for plant establishment, connect onsite weather sensor per manufacturer's specifications, and make sure controller programming is modified by weather sensor at end of contractor's 60-day maintenance period.

C. Provide written certification that materials and installation conform to drawings and these specifications.

3.08 ADJUSTING

A. Adjust control systems to achieve time cycles required.

B. Adjust pressure regulators and clean filters on drip lines at no additional cost to City.

3.09 GUARANTEE

A. Provide written guarantee against material defects, faults, leakage or improper operation for one year from Date of Substantial Completion, in addition to any manufacturers' warranties.

3.10 CONTROLLER CHARTS

A. Architect must approve record drawings before charts are prepared.

B. Provide controller chart showing the area covered by automatic controller, maximum size controller door will allow.

C. Chart shall be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.

D. Chart shall be blackline print and a different color used to show area of coverage for each station.

E. When completed and approved, the chart shall be hermetically sealed between two pieces of clear acrylic plastic, each piece being a minimum of 20 mils thick.

F. Charts must be completed and approved prior to final inspection of irrigation system.

3.11 SPARE ACCESSORIES

A. Provide three quick coupler locking covers.

B. Provide four quick coupler valve keys.

C. Provide operating manuals, manufacturer's warranties, and supplier's contact information for all irrigation equipment used on the job.

3.12 MAINTENANCE

A. The Contractor shall be responsible for all maintenance, repair, and programming of the new irrigation system for a period of sixty (60) days following completion of installation and approval by the Inspector. Maintenance shall include, but not be limited to, adjustment of drip line pressure and run times to prevent leakage outside of planting areas, repair of leaks, raising or lowering drip lines to match grade, flushing of drip lines, replacement of any defective or damaged equipment, programming of controller, coordination of irrigation system operation with County personnel, and any other normal maintenance work as directed by the Inspector.

B. After the system has been completed, the Contractor shall instruct County personnel in the operation and maintenance of the system, and shall furnish three complete sets of operating and maintenance instructions.

C. The three bound sets of operating and maintenance manuals are to contain complete parts lists of materials and equipment installed in the landscape irrigation system.

D. If, within one year from the Date of Substantial Completion, settlement occurs and adjustments in pipes, valves, drip line, deep root waterers, planting, or paving is necessary, Contractor shall make adjustments without extra cost or time to the Contract.

END OF SECTION

SECTION 32 93 00
PLANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Preparation of subsoil and topsoil.
   2. Provision and installation of trees, plants, ground cover, and sod.
   3. Mulch and fertilizer.
   4. Maintenance of landscape for a period of 60 days.

1.02 SUBMITTALS

A. Submit a list of all plant material, nurseries supplying plants, sizes, locations and description under provisions of appropriate specification sections.

1.03 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Tansy Ragwort, Bermuda Grass, Johnson Grass, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Brome Grass.

B. Plants: Living trees, shrubs, perennials, ground covers, and turf sod as specified in this Section.

1.04 QUALITY ASSURANCE

A. Nursery: Company specializing in growing and cultivating the plants specified on the drawings approved and certified by the State of California agricultural authority.

B. Installer: Licensed landscape contractor specializing in installing and planting the plants specified in this Section

1.05 REGULATORY REQUIREMENTS

A. Comply with regulatory requirements for herbicides and pesticides and their application.

B. Plant Materials: Certified by Federal Department of Agriculture; free of disease or hazardous insects.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis and manufacturer.

B. Protect plants until planted from sun scald, damage, or theft.

C. Deliver plant materials immediately prior to placement. Keep plants moist.

D. Do not prune prior to delivery.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install plants when ambient temperatures may drop below 35 degrees F or above 90 degrees F.

B. Do not install plants when wind velocity exceeds 30 mph.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with installation of underground irrigation system, utilities, piping and irrigation wiring. All painting, electrical work, paving, and utility improvements adjacent to landscape areas shall be completed prior to planting.

1.09 WARRANTY

A. Provide a 90-day warranty on all plant material under 15 gallon and a 1 year on all plant material 15 gallon and larger. Commence warranty on date identified in the Certificate of Substantial Completion.

B. Warranty: Include coverage of plants from death or unhealthy conditions.

C. Replacements: Plants of same size and species as specified, with a new warranty commencing on date of replacement.

1.10 MAINTENANCE SERVICE

A. Maintenance Services: Performed by installer.

B. Maintain all plants immediately after placement. Commence maintenance on date identified in the certificate of substantial completion for a period of sixty (60) days thereafter.

C. Maintenance to include:

1. Cultivation and weeding plant beds and tree wells.
2. Removal of weeds or application of herbicides for weed control in accordance with manufacturer's instructions. Remedy any damage resulting from use of herbicides.
3. Application of pesticides in accordance with manufacturer's instructions. Remedy any damage from use of pesticides.
4. Irrigating sufficient to saturate root system without overwatering.
5. Trimming, pruning, and deadheading spent flowers including removal of clippings and dead or broken branches and treatment of pruned areas or other wounds.
6. Replacement of all dead or dying plants at Contractor's expense.
7. Disease control.
8. Maintaining tree stakes: Repair or replace stakes and accessories as required.
9. Management and replacement of mulch to provide a consistent 3” thick layer in all planted area except turf and flatted ground cover.
10. Removal of trash and debris.
11. Establishment, protection, and mowing of sodded turf after sod is established, and replacement of any portions of sod that do not successfully take root.

PART 2 - PRODUCTS

2.01 TREES, PLANTS, AND GROUND COVER

A. Trees, Plants, and Ground Cover: Species, container size, and quantities identified in plant legend on drawings, grown in climatic conditions similar to those in locality of the Work. Trees and plants shall be symmetrical, size per industry standards for their containers, and form typical for variety and species. All trees and plants shall be sound, free of abrasions, knots, injuries, or disfigurements, vigorous, free from plant disease, insect pests or their eggs, and shall have healthy, normal root systems, well filling their containers, but not to the point of being root bound. All trees and plants shall be grown in nurseries inspected by the California State Department of Agriculture.

B. Plants shall be delivered to the site in a healthy condition and shall be properly stored and protected until planted.

C. Plants not conforming to these requirements shall be considered defective, removed from the site immediately and replaced with approved new plant material of same species and container size at the Contractor's expense.

2.02 TURF SOD

A. Turf sod shall be St. Augustine variety or approved equal, provided by a reputable sod growing company located not more than 150 miles from the project site, and inspected by the

California State Department of Agriculture. Sod shall not be on delivery truck for longer than 4 hours prior to being delivered to site.

2.03 SOIL AMENDMENT MATERIALS

A. Commercial Fertilizer: Slow-release fertilizer manufactured by Osmocote or equal.

B. Organic Amendment: Redwood, cedar, or fir sawdust or fine shavings, nitrolized and stabilized.

C. Magnesium supplement: K-Mag (sul-po-mag) (0-0-22).

D. Phosphorous supplement: Triple superphosphate (0-45-0).

E. Agriculture Gypsum: Pure content, as common to industry.

F. Sand: Clean, well-draining construction sand.

G. Water: Clean, fresh and free of substances that could inhibit healthy plant growth.

2.04 MULCH MATERIAL

A. Shredded wood bark, nitrolized and stabilized, free of growth or germination inhibiting ingredients.

2.05 ACCESSORIES

A. Tree Stakes: Softwood lumber, pointed end or mild steel angle, galvanized, pointed end.

B. Wire: Non-corrosive, of sufficient strength to withstand wind pressure and resultant movement of plant life.

C. Plant Protectors: Rubber sleeves over wire to protect plant tree trunks and branches.

2.06 SOURCE QUALITY CONTROL

A. Provide information on nurseries providing trees and plants at least one week prior to delivery to site, for inspection by County representative to verify acceptability of plants.

2.07 SOIL TESTING

A. Following rough grading, provide analysis of a minimum of three (3) samples of existing soil from site, as well as any imported topsoil if necessary.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter, pH value.

C. Submit minimum three samples of each to testing laboratory in sealed containers to prevent contamination.

D. Test reports shall include agricultural suitability analysis, soil fertility analysis and recommendations.

2.08 VERIFICATION

A. Provide letter of inspection for confirming approval of plants supplied.

PART 3- EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work of this Section.

B. Beginning the installation means acceptance of existing conditions.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain drainage profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots, debris, and rocks 2” diameter and larger. Remove any contaminated subsoil as directed by the Inspector.

C. Scarify subsoil to a depth of 12 inches. Repeat cultivation in areas where equipment used for hauling and spreading amendments has compacted subsoil.

3.03 SOIL AMENDMENT

A. Spread amendments over all areas to be planted with sodded turf or flatted ground cover. Hand dig or rototill to incorporate amendments into site soil to a depth of 6” and rake smooth.

B. Place amendments during dry weather.

C. Remove vegetable matter and foreign materials from soil prior to amending.

D. Grade amended soil to eliminate rough, low, or soft areas and for positive drainage.

D. The following amendments are for bidding purposes, and may be replaced by the recommendations of the soils analysis, as required by the Inspector:

1. Apply 3 cubic yards of organic amendment, nitrolized and stabilized per 1,000 sq. ft.
2. Apply 12 pounds K-Mag (sul-po-mag) per 1,000 sq. ft.
3. Apply 4 pounds Triple superphosphate per 1,000 sq. ft.
4. Apply agricultural gypsum at a rate of 10lbs. per 1,000 sq. ft.
5. Apply after initial raking of site soil.
6. Mix thoroughly into upper 6 inches of soil.
7. Lightly water to aid the dissipation of amendments.

3.04 PLANTING

A. Place plants for best appearance.

B. Set plants vertical.

C. Set plants in pits or beds with native, unamended but loose site soil in the bottom of pit under root ball, water to saturate soil to 12” deep. Plants shall be placed in the pits so that plant root ball will be one inch above surrounding finish grade.

D. Plant plants as per drawing and details.

E. Place backfill mix around root ball to surface of grade. The following amendments are for bidding purposes, and shall be replaced by the recommendations of the soils test as required by the Inspector:

1. 75 percent excavated soil free from all rocks 1 inch or larger.
2. 15 percent organic amendment.
3. 10 percent clean construction sand.
4. The following amendments, per cubic yard of backfill mix: ½ pound K-Mag (sul-po-mag), ¼ pound Triple superphosphate, and ½ pound agricultural gypsum.

F. Backfill materials shall be thoroughly mixed so that they are evenly distributed and without clods or lumps. Backfill material shall be level with surrounding soil after settlement.

G. The planting plans are a guide to plant locations. Due to field conditions, the plants may require relocation, therefore, before any plants are planted, obtain approval by Inspector 72 hours before planting.

H. Loosen roots and soil at edges of plant root ball being installed, mix with native soil.

I. Build a temporary 3-inch high basin around plants as they are planted and water several times before removing basin.

J. Do not plant trees and shrubs until final grades have been established and the planting areas properly graded.

K. Planting of Ground Cover from Flats: In areas to be planted with flatted ground cover, lightly compact to eliminate any air pockets, and smooth amended soil (no additional amendments required). Create a small hole and set plants vertically according to spacing designated on plans; do not allow stems or roots to fold or double. Press soil firmly around plants to eliminate any air pockets.

L. In the event that underground construction work or obstructions are encountered in the planting operation, select alternate locations and obtain acceptance by the Inspector.

3.05 MULCHING

A. Install a continuous 3" thick layer of shredded bark mulch throughout all landscape areas except turf sod following planting. In areas planted with flatted ground cover, mulch layer shall be 1-1/2" deep.

3.06 PLANT SUPPORT

A. Stake all trees as detailed on drawings.

3.07 PLANTING OF TURF SOD

A. Prepare soil as described in Article3.03 of this section. In addition, add 15 lbs. 12-12-12 commercial fertilizer per 1,000 sq. ft. of turf area unless otherwise directed by the Inspector.

B. Fine grade the surface of the amended soil to achieve surface drainage toward street or drains. Rake smooth and remove roots, clods, and rocks 1" or larger in diameter.

C. Roll soil with a lawn roller 1/3 full of water to firm surface, and readjust finish grade if necessary. Water prepared soil as necessary to provide a moist base for turf 4-6" deep.

D. Lay turf sod within 4 hours of delivery to site. Carefully butt sections together tightly, without stretching; avoid gaps or overlaps. Stagger the joints in each row in a brick-like fashion, using a large sharp knife to trim corners and edges.

E. After installing sod, roll the entire area with a water-filled roller to insure good contact with grade and remove air pockets.

F. Water sod thoroughly within ½ hour of installation, and at least daily or as needed to keep moist until turf is firmly rooted (approximately 2-3 weeks).

3.08 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of the appropriate specification sections.

B. Plants will be rejected if ball of earth surrounding roots has been disturbed, damaged or cracked prior to or during planting, if plant has been broken to the point of affecting form, and/or if plant is wilted or shows significant dieback.

3.09 WATERING

A. Apply water to plants during operations and thereafter until acceptance of work.

B. Plants that cannot be watered efficiently with the existing water system shall be watered by means of a hose.

C. Immediately after planting, apply water to each tree and shrub by means of a hose. Apply water in a moderate stream in the planting hole until the material around the roots is completely saturated from the bottom of the hole to the top of the ground.

D. Apply water in sufficient quantities and as often as seasonal conditions require to keep planted areas moist but not saturated, throughout and below the root systems of plants.

E. All plants shall be immediately sprinkled to avoid drying out until the entire planted area is thoroughly watered and the soil soaked to the full depth of each plant hole.

3.10 FERTILIZING

A. Fertilize all areas 30 days after starting maintenance period using pelleted slow-release fertilizer at the manufacturer's recommended rate; one application during maintenance period.

3.11 PROTECTION AND CLEAN-UP

A. Exercise all reasonable diligence in the protection of material during the work required by this section of the specifications. Any damage to this or adjoining work caused as a result of this contract shall be repaired immediately by Contractor without cost to the City. All excess material and equipment shall be removed from the site at completion of the work required in this section, and all areas shall be left in a clean satisfactory condition.

B. Walks and pavement shall be swept or washed clean upon completion of this work.

C. Throughout installation, empty plant containers shall be removed from the project site.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 33 05 28

UNDERGROUND UTILITIES MARKING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Underground warning tape for:

1. Electrical power duct banks.
2. Common user duct banks.
3. Potable and nonpotable water.
4. Reclaimed water.
5. Natural gas.
6. Sanitary and storm sewer force mains.
7. Compressed air.
8. Chilled water.
9. Irrigation mainline piping.

1.02 RELATED WORK SPECIFIED ELSEWHERE

1. Division 31 Section "Excavation and Fill for Utilities".
2. Division 26 Electrical Sections applicable to the scope of work.

1.03 QUALITY ASSURANCE

A. Reference specifications and standards:

1. ANSI: Z53.1 Safety Color Code for Marking Physical Hazards.

1.04 SUBMITTALS

1. Procedures: In accordance with Division 01 Sections.

B. Product data:

1. Manufacturer's detailed technical materials data, including technical bulletins, drawings, guides, and manuals, as applicable to the work of this Project.
2. For color coding of specific utilities not indicated on Drawings or not specified herein, submit samples of color-coding tape markings for selection by Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Marking tape:

1. Empire Level Manufacturing Corporation (Thor Enterprises), Mukwonago, WI. Tel: (800) 558-0722.

2. Mutual Industries North, Inc., Philadelphia, PA. Tel: (215) 927-6000, (800) 523-0888.
3. Reef Industries, Inc., Houston, TX. Tel: (713) 507.4250, (800) 231-6074.
4. Stranco Inc., Michigan City, IN. Tel: (219) 874-5221, (800) 348-3217.
5. T. Christy Enterprises, Inc. 655 E. Ball Road, Anaheim, CA. Tel: (714) 507-3300, (800) 258-4583.

2.02 MATERIALS

A. Marking tape: Reinforced or unreinforced type, 6 inches wide, inert, virgin resin, plastic film formulated for extended use underground, imprinted with an appropriate legend to define type of utility line it identifies.

1. Nondetectable: Minimum 4 mils overall thickness.
   a. DuraTec or ShieldTec by Empire Level Manufacturing Corporation (Thor Enterprises).
   b. Underground Tape (UT series) by Harris Industries, Inc.
   c. Non-Detectable Underground Marking Tape (No. 17783) by Mutual Industries North, Inc.
   d. Underground Warning Tape (PUWT-XXX series) by Stranco, Inc.
   e. Underground marking tape (No. TA-ND-6-GI) 6 inches non-detectable green irrigation marking tape by T. Christy Enterprises.
2. Detectable: Double-lamination/sandwich with continuous aluminum core, minimum 5 mils overall thickness. Provide manufacturer's splice clips or other accessory materials to maintain conductivity throughout entire length of tape installation.
   a. ThorTec or MagnaTec by Empire Level Manufacturing Corporation (Thor Enterprises).
   b. Underground Tape (DU series) by Harris Industries, Inc.
   c. Underground Detectable Tape (No. 17774) by Mutual Industries North, Inc.
   d. Detect-A-Line Detectable Underground Warning Tape (PUWT-XXXD series) by Stranco, Inc.
   e. Terra Tape Sentry Line 1350 by Reef Industries, Inc.
3. Color code: Black lettering on color backgrounds in accord with APWA/ULCC Uniform Color Code and ANSI Z53.1, except as follows.
   a. Red: Electric power ductbanks other than high voltage (e.g., 12 kV) electric power ductbanks.
   b. Yellow: Natural gas distribution and transmission.
   c. Orange: Common user ductbanks.
   d. Black or white lettering on blue background: Potable and nonpotable water systems.

e. Black or white lettering on brown background: Sanitary and storm sewer force mains.

f. Yellow lettering on purple background: Reclaimed water lines.

g. Black lettering on light blue background: Compressed air systems.

h. Black lettering on green background with brown band striping: Chilled water systems.

i. Black lettering on silver background with orange band striping: Hot water systems.

j. Black lettering on green background: Irrigation mainline piping reading "CAUTION IRRIGATION LINE BELOW".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Marking tape:

1. Nondetectable tape: Install over metallic utility lines.

2. Detectable tape: Install over nonmetallic utility lines.

3. For trenches which contain only one utility line, install one marking tape directly on top of each utility line (at the 12 o'clock position), install one additional tape 12 inches above the centerline of the utility line, and install one additional marking tape 18 inches to each side of centerline of utility line, a total of four utility marking tapes for a single common utility line in a single trench.

4. For trenches in common which contain more than one utility line, install one marking tape directly on top of each utility line (at the 12 o’clock position), install one additional tape for the proper utility 12 inches above the center of the utility line, and one additional marking tape for each utility in the common trench, installed 18 inches to each side of the edge of each of the outboard utility lines, a total of 8 utility marking tapes for 2 utility lines in a single common trench; a total of 12 utility marking tapes for 3 utility lines in a single common trench; a total of 16 utility marking tapes for 4 utility lines in a single common trench, etc.

END OF SECTION

SECTION 33 10 00

SITE WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. On-site potable water, fire water and reclaimed water distribution systems, including connections to existing systems, sterilization, testing of water mains, and all appurtenances required for the complete systems.

B. Systems design pressure is 125 psig.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 Section "Cast-In-Place Concrete".

B. Division 09 Section "Painting (Professional Line Products)".

C. Division 31 Section "Excavation and Fill for Utilities".

D. Division 33 Section "Underground Utilities Marking".

1.03 REQUIREMENTS

A. Comply with all requirements of the governing authority, including:

1. No connection shall be made to potable, fire and industrial water lines without written approval from the governing authority.
2. When construction water is needed by Contractor, no connection to the existing main shall be used until an approved backflow prevention device is installed by Contractor.
3. Valves of existing public systems shall not be operated by any person other than Water Department personnel.
4. No connections will be allowed from new to existing water mains until pressure test has been accomplished.
5. All new potable water and/or fire systems shall be sterilized (chlorinated) by Contractor.

1.04 SUBMITTALS

A. Procedures: In accordance with Division 01 Sections.

B. Submit brochures and shop drawings with such promptness as will allow ample time for review and corrections procedures.

1. Approval will not relieve Contractor of the sole responsibility for the correctness of the work.

C. Shop drawings: Shop drawings and detailed descriptions for items which are not manufactured and which have to be specially fabricated for work of this Contract.

D. Product data: Give name or other identification of each item to be provided as part of work of this Contract. The assembled brochures shall show cuts and fully detailed descriptions of all manufactured items furnished.

1. Presentation: Arrange materials in the same sequence as the Specifications and mark each item in the lower right-hand corner with Section, Article, and Sub-Article number.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Ductile Iron Pipe: US pipe as specified or equivalent by American.

B. Shut-off valves: Mueller as specified or equivalent by Clow, Dresser, Kennedy or Stockham.

2.02 MATERIALS AND METHODS

A. Water piping Type I:

1. 4 inches and larger: Ductile iron pipe, Pressure Class 350, conform to requirements of AWWA C151-76 ANSI A21.51 under method outlined in AWWA C150/ANSI A21.50. The pipe shall be cement mortar lined in accord with AWWA C104-80/ANSI A21.40.

2. 3 inches and smaller: Schedule 80 PVC conform to requirements of ASTM D 1785, Type 1, Grade 1.

B. Water piping Type II: Polyvinyl chloride (PVC) pipe in conformance with all requirements of AWWA C900, Class 200; use purple pigmented for reclaimed water.

C. Fittings:

1. For all ductile iron pipe and PVC pipe 4 inches and larger: Cement-lined ductile or cast iron, 250 lb.

a. Use tapped tees or flanged adapters at connections of copper piping to ductile iron or PVC piping.

2. For PVC pipe 3 inches and smaller: PVC socket fittings for solvent welding.

D. Joints for pipe and fittings:

1. Ductile iron piping and fitting:

a. Above ground: Flanged joints conforming to ANSI B16.1.

b. Underground: US pipe TR flex or equivalent by American Flex-Ring Mechanical joint with Mega-Lug retainer gland is permitted to be used only on the last pipe joint before a fitting. Provide a concrete support block for any Mega-Lug joint.

2. PVC piping:

a. 4 inches and larger: Integral bell containing a lock-in ring and spigot.

1) Pipe joints shall be push on as specified in ASTM D 3139.

2) Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.

3) Gaskets for push on joints for pipe shall conform to ASTM F 477.

4) Gaskets for push on joints and compression type joints or mechanical joints for connections between pipes and metal fittings, valves, and other accessories shall be as specified in AWWA C111/A21.11.

b. Poly Vinyl Chloride (PVC) Water Main Fittings shall be gray-iron or ductile iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings. Fittings shall be mechanical joints.

c. 3 inches and smaller: Solvent welded per manufacturers recommendations.

E. Flanges:

1. For ductile iron pipe: 125 lb., ductile or cast iron, threaded, ASTM A 126 and ANSI B16.1.

2. Gaskets: Non-asbestos type composition, 1/16 inch thick, equivalent to Garlock Style 3000.

3. Bolting materials: Carbon steel Heavy Hex bolts and nuts, ASTM A 307, Type B.

F. Valves, and accessories:

1. Shut-off valves: Mueller as specified or equivalent by Clow, Dresser, Kennedy, or Stockham.

a. Valves 4 inches and larger: AWWA approved, 200 lb.

b. Valves 14 inches and larger: AWWA approved, 150 lb.

1) Buried: Mueller #A-2360-23, with 2 inch square operating nut, and mechanical joint ends provided with retainer glands as specified under paragraph "Joints" for ductile iron piping. Provide concrete support block under buried valve.

a) Provide Bingham and Tylor or equivalent by Alhambra foundry - cast iron adjustable type valve box with proper extension to 6 inches below bottom of grade, and cast iron collar and cover. Cast "WATER" in cover.

2) Above grade: Mueller #A-2380-6, with wheel handles and flanged ends.

c. Valves less than 4 inches size: Federal Specifications WW-V-54, Class A, Type III, bronze, double wedge, non-rising stem, screwed bonnet, 200 psi W.O.G. working pressure, stuffing box repackable under pressure, all parts renewable, ends as indicated.

2. Backflow preventers: Provide where indicated on the plans.

3. Pressure regulating valve: Pressure reducing, pressure sustaining and check valve. Size 8 inch, 125 lb. Class, flanged, ratings: Downstream 15 to 75 psi, upstream 20 to 200 psi, equivalent to G.A. Industries Figure No. 4700.

4. Vent and vacuum valves: Provide where indicated, APCO Model No. 145C, 2 inch, or Crispin Model U20. Provide covered valve pits as indicated.

G. Pipe guards: Provide where indicated. Guards shall be 4 inch Schedule 40 galvanized steel pipe filled with concrete. Guards shall be 7 feet long, extending 4 feet above finished grade and set in a concrete footing (1 foot - 6 inches diameter by 3 feet - 6 inches deep).

H. Corrosion protection: All buried uncoated and/or otherwise unprotected valves, clamps, flanges, bolts, nuts, etc., shall be cleaned, primed and coated with a coal tar base protective coating (1/32 inch thick) equivalent to Carboline (Kop-Coat) Bitumastic 50. Apply in accord with manufacturer's instructions.

I. Pipe wrapping where indicated: Polyethylene wrap, ANSI A21.5 (AWWA C105) 8 mils thick.

PART 3 - EXECUTION

3.01 EXCAVATING, TRENCHING, BACKFILLING, AND COMPACTING

A. Perform in accord with requirements of Division 31 Section "Excavation and Fill for Utilities".

3.02 INSTALLATION

A. Coordinate the installation of this part of the work with the overall construction schedule.

B. Provide concrete thrust blocks at all buried fittings and stub ends on 4 inch and larger PVC lines, and as indicated on Drawings.

C. Repair all damaged lining according to AWWA C104 and according to

D. Connect to existing system where indicated.

E. Tests: In accord with the following:

1. Test entire system at 1.5 times system design pressure. Maintain test pressure for at least 4 hours or longer as directed by Owner to prove tightness without leaks.

F. Install pipes and fittings in accord with manufacturer's recommendations. Provide 30 inches cover from top of pipe to finish grade.

3.03 DISINFECTION

A. Thoroughly clean, chlorinate, drain, and flush all pipe, fittings, valves, and appurtenances which have been exposed to contamination by the construction, in accord with the AWWA Specification C601-68.

B. Owner should be notified 24 hr. in advance of disinfection of all new potable water lines.

1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.
2. Disinfect pipe using sodium hypochlorite to produce a dosage of 50 mg/l for a 24-hr. contact period.
3. Open and close all valves several times during disinfection period.
4. After 24-hour retention period, flush chlorinated water from the line until chlorine concentration of water leaving the main is no higher than that generally prevailing in the existing system, or less than 1.0 mg/l.
5. Provide corporation stop or similar connection and obtain sample for bacteriological analysis.
6. Repeat disinfection procedure until bacteriological analysis results are acceptable to Owner.

3.04 CLEANING

A. Restoration: Any settlement of pavement or backfill, or erosion over or in the trenches shall be replaced or repaired by Contractor and the surface brought to grade. Special precautions shall be taken to prevent storm water erosion of trenching. Storm water culverts and structures shall be kept clean of mud, debris, and silt caused by the construction.

3.05 PIPELINE IDENTIFICATION

A. Provide in accord with Division 33 Section "Underground Utilities Marking".

END OF SECTION

SECTION 33 30 00

SANITARY SEWAGE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Gravity sanitary sewerage collection system including:

1. Gravity sanitary sewer pipe.
2. Cleanouts.
3. Alteration of existing sewerage structures.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 Section "Cast-In-Place Concrete".

B. Division 31 Section "Excavation and Fill for Utilities".

C. Division 33 Section “Underground Utilities Marking”.

D. Division 33 Section “Site Water Distribution System”.

E. Division 33 Section "Storm Drainage System".

1.03 QUALITY ASSURANCE

A. Tests and inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Required tests:
   a. After alignment tests have been completed, and before flows are allowed in the line, conduct leakage tests.
   b. Test entire system for exfiltration in presence of engineer. Limit leakage to 100 gallons per inch of pipe diameter per mile of length per 24 hour.
   c. Limit leakage to stated maximum limit, except that an allowance of an additional 10 percent of gallonage will be allowed for each additional 2 feet of head over a basic 2 feet minimum above all pipe soffits.
   d. Pay for all leakage tests and required repairs and reconstruction.

B. Reference specifications and standards:

1. AASHTO: Specifications for Highway Bridges.
2. AASHTO: M 198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
3. ASTM: A 48 Gray Iron Castings.
4. ASTM: A 746 (ANSI/AWWA C151/21.51) Ductile Iron Pipe.
5. ASTM: C 94 Ready-Mix Concrete.
6. ASTM: C 150 Portland Cement.

7. ASTM: C 443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
8. ASTM: C 478 Precast Reinforced Concrete Manhole Sections.
9. ASTM: C 923 Watertight Resilient Connectors for Manhole to Pipe Seal.
10. ASTM: D 1248 Polyethylene Plastics Molding and Extrusion Materials.
11. ASTM: D 1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
12. ASTM: D 2122 Determining Dimension of Thermoplastic Pipe and Fittings.
13. ASTM: D 2321 Underground Installation of Flexible Thermoplastic Sewer Pipes.
14. ASTM: D 2412 Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
15. ASTM: D 3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
16. ASTM: D 3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
17. ASTM: F 477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
18. ANSI/AWWA: C105/A21.5 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
19. ANSI/AWWA: C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
20. ANSI/AWWA: C150/A21.50 Thickness Design of Ductile-Iron Pipe.
21. ANSI/AWWA: C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids.

C. Allowable tolerances for manhole frames/drainage inlets and cleanouts:
1. Horizontal location: Within ±3 inches, in any direction, of horizontal location indicated on Drawings.
2. Vertical alignment: Not greater than 1/8 inch maximum tolerance for 6 feet of depth.

1.04 SUBMITTALS

A. Procedure: In accordance with Division 01 Sections.

B. Product data: Manufacturer's detailed technical materials, fabrication, and installation data, including technical bulletins, drawings, guides, and manuals, as applicable to the work of this Project.

C. Certifications: Manufacturer's certification that pipe and fittings have been inspected and tested at the point of origin, and are in compliance with specified requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe and fittings:

1. Polyvinyl chloride (PVC) pipe and fittings for mainlines 15 inches and smaller: Conform to ASTM D 3034, SDR 35 or Schedule 40 DWV.
    a. Manufacture pipe from approved, Type 1, Grade 1, PVC 12454-C conforming to ASTM D 1784 and meeting requirements of ASTM D 2122 and ASTM D 2412.
    b. Pipe shall have integral wall thickened bells or extruded couplings with gasket seals. Solvent weld joints will not be permitted.
    c. Pipe joints shall be gasket push-on type complying with ASTM D 3212 and ASTM F 477.
    d. Pipe shall be UL/FM approved.
    e. Fittings shall conform to the same specifications as pipe in which they are to be installed.
    f. Pipe shall be identified on the exterior of the pipe with the following information:
        1) Nominal pipe size and o.d. base.
        2) Material code designation number (12454C).
        3) Dimension ratio number (SDR 35).
        4) Pipe Stiffness Designation (PS46).
        5) ANSI/ASTM Designation (D3034).
        6) Pipe manufacturer's name and production code.

PART 3 - EXECUTION

3.01 INSTALLATION/PERFORMANCE

A. Excavating, trenching, backfilling, and compacting: In accord with Division 31 Section "Excavation and Fill for Utilities".

B. Pipe laying: Lay pipe as indicated on Drawings, as specified herein, and in compliance with applicable portions of ASTM D 2321.
    1. Grade trench bottom to indicated elevation of pipeline and shape bottom to fit lower quadrant of pipe. Excavate holes at each bell hub such that pipe will be uniformly supported along entire length of barrel only.
    2. Pipe installation and jointing shall be in accord with pipe manufacturer's specifications and instructions for type of pipe used and applicable requirements specified herein. All pipe having a defective joint, bell, or spigot is unacceptable, shall be rejected, removed from site, and replaced with an acceptable unit.
    3. Commence pipe laying in finished trench at lowest point, or from a point designated by Owner, and lay upgrade from point of connection with all bell ends forward.

4. Install pipe to homing mark on spigot. On field cut pipe, provide a homing mark on spigot end in accord with manufacturer's recommendations.
5. Maintain pipe alignment and joint closure until sufficient haunching and backfill is in place to adequately hold pipe in position.
6. Prevent foreign materials from entering pipe while it is being placed in trench. Do not place debris, tools, articles of clothing, or other materials in pipe at any time.
7. As each length of pipe is placed in trench, assemble joints and bring pipe to intended line and grade. Bed and secure pipe in place.
8. When pipe laying is delayed for 10 min. or more, close open ends of pipe using a watertight plug or other approved means to ensure that absolute cleanliness is maintained inside pipe.
9. At penetrations of manhole and similar structures, smoothly cut penetrating ends of pipe parallel to interior surface of structure. Maximum interior protrusion of pipe shall be the minimum necessary for proper sealing of pipe connection to structure. Use resilient connector when indicated on Drawings.

C. Pipe jointing:

1. Pipe installation and jointing shall be in accord with pipe manufacturer's specifications and instructions for type of pipe used and applicable requirements specified herein.
2. Ensure that interior of pipe and jointing seal is free of sand, dirt, trash, or other foreign materials before installation. All pipe or fitting that has been installed containing dirt or other deleterious material shall be removed, cleaned, and relaid. Extreme care shall be taken to keep bells of pipe free from sand, dirt, or rocks so that joints may be properly assembled without overstressing bells.

3.02 FIELD QUALITY CONTROL

A. Alignment: Inspect sanitary sewerage lines to determine if displacement of pipe has occurred during backfilling and compaction.

B. Correct, at no additional cost, sections of piping that are deficient in material, alignment, grade, or joints.

END OF SECTION 33 30 00

SECTION 33 40 00

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Storm drainage system includes:

1. Storm drainage pipe.
2. Catch basins.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 Section "Cast-In-Place Concrete".

B. Division 31 Section "Excavation and Fill for Utilities".

C. Division 33 Section “Underground Utilities Marking”.

1.03 QUALITY ASSURANCE

A. Tests and inspections:

1. Procedure: In accordance with Division 01 Sections.
2. Required tests:
   a. Conduct leakage tests subsequent to alignment inspections and prior to flows being allowed in the line.
   b. Test entire system for exfiltration in the presence of Owner. Limit leakage to 200 gallons per inch of pipe diameter per mile of length per 24 hours. Actual duration of test will be 4 hours.
   c. Limit leakage to stated maximum limit, except that an allowance of an additional 10 percent of gallonage will be allowed for each additional 2 feet of head over a basic 2 feet minimum above pipe soffits.
   d. Contractor shall be responsible to pay for leakage tests and required repairs and reconstruction.

B. Requirements of regulatory agencies: In addition to complying with other legal requirements, comply with CALTRANS Standard Specifications.

C. Reference specifications and standards:

1. AASHTO: Specifications for Highway Bridges.
2. ASTM: A 48 Gray Iron Castings.
3. ASTM: C 94 Ready-Mix Concrete.
4. ASTM: C 150 Portland Cement.
5. ASTM: C 478 Precast Reinforced Concrete Manhole Sections.

6. ASTM: C 923 Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
7. ASTM: D 1248 Polyethylene Plastics Molding and Extrusion Materials.
8. ASTM: D 1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
9. ASTM: D 2122 Determining Dimension of Thermoplastic Pipe and Fittings.
10. ASTM: D 2321 Underground Installation of Thermoplastic for Sewers and Other Gravity Flow Applications.
11. ASTM: D 2412 Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
12. ASTM: D 3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
13. ASTM: D 3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
14. ASTM: F 477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
15. CALTRANS: Standard Specifications.
16. Fed. Spec. SS-S-210a Preformed Plastic Sealing Compound for Expansion Joints and Pipe Joints.
17. SSPWC (Standard Specifications for Public Works Construction).

D. Allowable tolerances for manhole frames/drainage inlets and cleanouts:

1. Horizontal location: Within ±3 inches, in any direction, of horizontal location indicated on Drawings.
2. Vertical alignment: Not greater than 1/8 inch maximum tolerance for 6 feet of depth.

1.04 SUBMITTALS

A. Procedure: In accordance with Division 01 Sections.

B. Product data: Manufacturer's detailed technical materials, fabrication, and installation data, including technical bulletins, drawings, guides, and manuals, as applicable to the work of this Project.

C. Certifications: Manufacturer's certification that pipe and fittings have been inspected and tested at the point of origin and are in compliance with specified requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe and fittings:

1. Polyvinyl chloride (PVC) pipe and fittings for main lines 15 inches and smaller: Conform to ASTM D 3034, SDR 26 or Schedule 40 DWV.

a. Manufacture pipe from approved, Type 1, Grade 1, PVC 12454-C conforming to ASTM D 1784 and meeting requirements of ASTM D 2122 and ASTM D 2412.

b. Pipe shall have integral wall thickened bells or extruded couplings with gasket seals.

c. Pipe joints shall be gasket push-on type complying with ASTM D 3212 and ASTM F 477.

d. Pipe shall be UL/FM approved.

e. Fittings shall conform to same specifications as pipe in which they are to be installed.

f. Pipe shall be identified on exterior with the following information:

1) Nominal pipe size and o.d. base.

2) Material code designation number (12454C).

3) Dimension ratio number (SDR 35).

4) Pipe stiffness designation (PS46).

5) ANSI/ASTM designation (D3034).

6) Pipe manufacturer's name and production code.

B. Manhole frame, cover, and adjustment rings: Gray iron castings conforming to ASTM A 48 Class 30 and ASTM C 478.

1. Frames and covers shall be traffic bearing and capable of supporting H-20 loadings in accord with AASHTO Specifications for Highway Bridges.

2. Manhole frame, cover, and adjustment rings shall be as indicated on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION/PERFORMANCE

A. Excavating, trenching, backfilling, and compacting: In accord with Division 31 Section "Excavation and Fill for Utilities".

B. Pipe laying: Lay pipe as indicated on Drawings, as specified herein, and in compliance with applicable portions of ASTM D 2321.

1. Grade trench bottom to indicated elevation of pipeline and shape bottom to fit lower quadrant of pipe. Excavate holes at each bell hub such that pipe will be uniformly supported along entire length of barrel only.

2. Pipe installation and jointing shall be in accord with pipe manufacturer's specifications and instructions for type of pipe used, and applicable requirements specified herein. Any pipe having a defective joint, bell, or spigot is unacceptable, shall be rejected, removed from site, and replaced with an acceptable unit.

3. Commence pipe laying in finished trench at lowest point, or from a point designated by Owner, and lay upgrade from point of connection with bell ends forward.

4. Install pipe to homing mark on spigot. On field cut pipe, provide a homing mark on spigot end in accord with manufacturer's recommendations.

5. Maintain pipe alignment and joint closure until sufficient haunching and backfill is in place to adequately hold pipe in position.

6. Prevent foreign materials from entering pipe while it is being placed in trench. Do not place debris, tools, articles of clothing, or other materials in pipe at any time.

7. As each length of pipe is placed in trench, assemble joints and bring pipe to intended line and grade. Bed and secure pipe in place.

8. When pipe laying is delayed for 10 minutes or more, close open ends of pipe using a watertight plug or other approved means to ensure that absolute cleanliness is maintained inside pipe.

9. At penetrations of manhole and similar structures, smoothly cut penetrating ends of pipe parallel to interior surface of structure. Maximum interior protrusion of pipe shall be the minimum necessary for proper sealing of pipe connection to structure. Use resilient connector when indicated on Drawings.

C. Pipe jointing:

1. Pipe installation and jointing shall be in accord with pipe manufacturer's specifications and instructions for type of pipe used and applicable requirements specified herein.

2. Ensure that interior of pipe and jointing seal is free of sand, dirt, trash, or other foreign materials before installation. Remove, clean, and re-lay pipe or fittings that have been installed containing dirt or other deleterious material. Extreme care shall be taken to keep bells of pipe free from sand, dirt, or rocks so that joints may be properly assembled without overstressing bells.

3. Reinforced concrete pipe:

a. Rubber gaskets:

1) At all joints, except at penetrations of manhole and similar structures.

2) Immediately prior to joining pipe sections, lubricate rubber gaskets using Owner-approved lubricant.

3.02 FIELD QUALITY CONTROL

A. Alignment: Inspect storm drainage lines to determine if displacement of pipe has occurred during installation of bedding and compaction.

B. Leakage: Conduct initial leakage tests. Failure to pass leakage test requirements shall require mortaring suspect joints as directed by Owner and subsequent leakage retests. Continued failure to pass leakage retests shall require removal and reinstallation of suspect pipe sections and replacement of suspect joint seals with new gaskets.

C. Correct, at no additional cost to Owner, sections of piping that are deficient in material, alignment, grade, or joints.

END OF SECTION 33 4000