SECTION 01 45 24 – ENVIRONMENTAL IMPORT/EXPORT MATERIALS TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 1 – General Requirements

B. Section 01 11 00 – Summary of Work

C. Section 01 31 13 – Project Coordination

D. Section 01 32 13 – Construction Schedule

E. Section 01 33 00 – Submittal Procedures

F. Section 01 77 00 – Contract Closeout

G. Section 31 22 00 – Grading

H. Section 31 23 16 – Excavation and Fill for Pavement

I. Section 31 23 23 – Excavation and Fill for Utilities

J. Section 32 11 00 – Base C

1.2 SUMMARY

A. This Section specifies the requirements for the sampling, testing, transportation and certification of imported fill materials or exported fill materials from project sites.

B. This Section defines:
   1. Contractor requirements for use of existing, imported or generated materials on project sites.
   2. Contractor requirements for stockpiling materials for use on project sites
   3. Contractor requirements for exporting materials from a site including transportation.
   4. Testing requirements for all materials imported, exported, stockpiled or generated for use on a site.
   5. Contractor testing and reporting requirements
   6. Contractor submittal requirements/

1.3 OBJECTIVES

A. Ensure that fill materials imported to sites are safe for staffs and visitors.

B. Ensure that materials exported from project site for use at offsite disposal/recycling are adequately characterized for lawful disposition.

C. Ensure that representative data be collected so that analytical determinations can be made in regard to the first two objectives

D. Require Contractor to contract with and pay for the services of a licensed environmental professional (licensed State of California Professional Engineer [PE Civil] or Professional Geologist [PG]) familiar with environmental site assessment and waste classification and disposal requirements to perform such services.

E. Require Contractor to contract with and pay for an independent, approved California Department of Health Services certified testing laboratory to perform analytical testing of imported, exported and site generated fill materials.

F. Require Contractor to pay all fees required by authorities having jurisdiction over area.

G. Require Contractor to post bonds required by authorities having jurisdiction over area.

1.4 DEFINITIONS

A. Definitions not furnished in text of this section:
   1. CEQA: California Environmental Quality Act.
   2. EIR: Environmental Impact Report.
   3. Environmental Health Supervisor, Environmental Compliance Group: Individual at OEHS, who ensures Owner compliance with all pertinent regulations, ordinances, codes, and/or policies.
   4. OEHS: Owner's Office of Environmental Health and Safety.
   5. Licensed Environmental Professional: Person licensed in the State of California and with sufficient knowledge and experience to competently perform environmentally-related work, including (but necessarily limited to) environmental site investigations, remedial projects, and other tasks involving the collection of soil, soil vapor, and groundwater samples; the selection of analytical methods for said samples; the interpretation of analytical data; the preparation of work plans, reports, and other relevant documents; and the supervision and/or oversight of remedial contractors. For the purposes of this Section, a licensed environmental professional

shall include a Professional Geologist or "P.G." or a Civil Professional Engineer or "P.E."

6. ug/kg: micrograms/kilogram.
7. mg/kg: milligrams/kilogram.
8. NA: Not Applicable.

9. RCRA: federal Resource Conservation and Recovery Act.
10. Soil Certification/Sample Data Report: Report documenting location, volume, sampling procedures, analytical methods, chemical test results, and recommendations for either disposing or re-using stockpiled soil excavated from Owner sites or proposed for import to same. Preparation of report is to follow the procedures given in Article 1.04 of this Section.
11. Soil Sampling Plan (SSP): As described in Article 1.04 of this Section, a document providing sufficient guidance with which to adequately characterize soil proposed for import to, or export from, a project site. Guidance in this document is to be in accordance with the procedures described in Article1.04 of this Section.
12. STLC: Soluble Threshold Limit Concentrations as defined in Tables II and III, Chapter 11, Article 3, § 66261.24-1 of Title 22 of the California Code of Regulations (CCR).
13. TCLP: Toxicity Characteristic Leaching Procedure, test Method 1311, documented in Title 40, Part 261, Subpart C, § 261.24 of the Code of Federal Regulations (CFR).
14. TPH: Total Petroleum Hydrocarbons.
15. TTLC: Total Threshold Limit Concentrations, as defined in Tables II and III, Chapter 11, Article 3, § 66261.24-1 of Title 22 of the CCR.
16. USEPA or EPA: United States Environmental Protection Agency.
17. VOCs: Volatile Organic Compounds.
18. WET: Waste Extraction Test, as defined in Appendix II-1, Chapter 11 of Title 22 of the CCR.

1.5 SUBMITTALS

A. Contractor shall submit to OAR for transmittal to the OEHS:
   1. A qualifications statement for Contractor's independent California certified testing laboratory and required licensed environmental professional (California Professional Civil Engineer (PE) or Professional Geologist (PG) prior to the start of Work. Contractor's licensed environmental professional must possess recent demonstrated environmental experience in soil sampling and waste classification.
   2. A draft import/export Soil Sampling Plan (SSP) prepared by Contractor's licensed environmental professional for review and concurrence by OEHS. The objective of the SSP is to obtain representative sample data. The Draft SSP or equivalent document acceptable to OEHS must be submitted at least 72 hours prior to all

proposed import/export sampling activities. The consultant's proposal (with or without fees) is acceptable in lieu of a SSP.

a. At a minimum, the Draft SSP shall include a site map which shows the location of the proposed import/export soils and the location and number of the proposed stockpile samples. The draft SSP shall also contain information pertaining to the total volume of the stockpile proposed for sampling and the rationale in support of the proposed sampling approach. Existing environmental documentation specific to the import/export site shall be utilized by the Contractor's environmental professional to support the proposed sampling approach and analytical method suite. It is the responsibility of the Contractor to request this information in advance from the OAR if they do not already have access to a copy at the jobsite.
b. Lacking this information or rationale, samples shall be analyzed for all analytical methods described in paragraph 3.02 E. Guidance for the minimum number of samples per total volume of soil to be excavated is provided in Table 1. Supplemental samples may be required by OEHS if pothole sampling is utilized. In addition, the draft SSP shall contain all necessary contact information for the import/export site and a proposed schedule for the sampling activities.
c. OEHS will either approve the document or request that revisions be made. This process shall continue until OEHS approves the draft SSP.

3. Draft Soil Certification/Sample Data Report:
   a. A draft Soil Certification/Sample Data Report prepared by Contractor's licensed environmental professional for review and concurrence. At a minimum the draft Soil Certification/Sample Data Report shall contain:
      1) A site map showing the location of the in situ sampling locations or the stockpile(s) and stockpile sample locations.
      2) A detailed discussion and evaluation of the laboratory results.
      3) A summary of findings and recommendations that provide a determination on the waste classification of the subject materials, based on the representative sample results.
      4) Recommendations for additional step-out samples, if any.
      5) Chain-of-custody forms and all laboratory data with respective QA/QC sheets.
   b. Contractor must allow OEHS a minimum of 72 hours to review the draft Soil Certification/Sample Data Report. OEHS will either approve the document or request that revisions be made. This shall continue until OEHS approves the draft Soil Certification/Sampling Data Report.
   c. Upon revision of the draft Soil Certification/Sample Data Report by the Contractor's licensed environmental professional and acceptance by OEHS, the final report, signed and stamped by the licensed professional, shall be submitted to the OAR for distribution to OEHS and the project file. If the soil is to be exported to or imported from, a site, if it satisfied the requirements of paragraphs 3.02.F and 3.02.G of this Section, then a PG or civil PE must sign and stamp the final report.
      1) The Environmental Health Supervisor, Environmental Compliance Group will confirm that the proposed waste classification for the proposed

import/export material is appropriate. For materials designated unacceptable for export except to a licensed facility, or for those materials sent electively by Contractor to a licensed facility, the Environmental Health Supervisor, Environmental Compliance Group will provide information on the necessary waste manifest documentation.

2) If an OAR/Complex Project Manager (CPM) would like OEHS to conduct the soil sampling and/or soil removal, the OAR/CPM should submit a Project Referral Form with completed COLIN funding line information to OEHS at least 3 weeks prior to when the work needs to be conducted.

4. Written documentation, e-mail is acceptable, verifying that all export soil data for any soils exported for use at the site, including the final Certification Report prepared by Contractor's licensed environmental professional, were provided to the proposed recipient prior to export and delivery.
5. Prior to import/export, written documentation in the form of a letter sent by the transporter to the Contractor, who must in turn submit it to OEHS, to verify the following:
   a. The hauling contract for each load imported to, or exported from, the site specifies the use of "clean" trucks and/or trailer beds, in which the material will be carried;
   b. The actual trucks and/or trailer beds utilized for import/export activities will be clear of visible contamination or deleterious materials;
   c. The trucks will go directly from the source location to the recipient location with no detours or stops at other locations; and
   d. Short loads will not be augmented by other materials that were not tested as part of the final SSP.
   e. All import/export transportation activities shall be conducted in accordance with all applicable local, state and federal rules and regulations.
6. Certification, in the form of haul tickets or completed waste manifests, documenting the volume and recipient of all import/export materials and activities. This documentation shall be coordinated through the OEHS Environmental Health Supervisor, Environmental Compliance Group.
   a. For approved import/export to unregulated facilities (landfill), haul tickets may be utilized, but shall contain the following minimum information:
      1) Date(s) of haul activity.
      2) Address of source site.
      3) Address of recipient.
      4) Load volume.
      5) Time of departure from source.
      6) Time of arrival at recipient site.
      7) Signature of recipient or recipient's agent.
      8) It is the Contractor's responsibility to confirm that no other trips or short-load augmentation occurred and submit documentation to the OAR and OEHS.
   b. For export to regulated facilities (landfills, recyclers, etc.), the appropriate waste manifest as determined by the OEHS Environmental Health Supervisor,

Environmental Compliance Group in paragraph 1.04.A.3 must be completed and a copy of the executed manifest, signed by the receiving site, must be provided to the OAR. The waste manifest copy, signed by the receiving facility and based on the manifest address, will be sent directly to OEHS and the OEHS Environmental Health Supervisor, Environmental Compliance Group.

1.6 APPROVALS

A. No import or export of earth or geotechnical grading or filling materials can occur at Owner sites without prior approval by OEHS

PART 2 - PRODUCTS

2.1 MATERIALS

A. Imported:
   1. Soils: Soils proposed for import shall be tested pursuant to the requirements of this Section (01 4524), unless a variance has been requested by Contractor and approved by OEHS prior to the import of the subject materials.
   2. Gravels: Clean gravel, consisting of native rock from a commercial source, may be granted a variance from the testing requirements of this Section provided a request for variance is submitted by Contractor for review and approval at least 72 hours prior to import. Contractor shall provide written documentation, which identifies the source, volume and proposed transport date(s) of the material for review.
      a. Furthermore, a letter signed and stamped by either a Civil PE or PG and originating from the commercial source must state the following:
         1) The quarry does not mine ultramafic (i.e. natural asbestos containing) materials.
         2) The gravel is produced from virgin aggregate materials and does not contain any contaminated or reclaimed or recycled materials.
      b. Additionally, a letter from the material transporter and signed by the same must state the following:
         1) Haul truck and/or trailer beds transferring the material are clear of visible contamination and deleterious materials.
         2) Haul trucks will go directly from the quarry source to the site with no trips or augmentation of short loads with other materials.
      c. The request for variance requires approval by OEHS prior to Contractor importing the materials.
   3. Miscellaneous Material: No miscellaneous material containing crushed concrete, asphalt, construction debris, recycled, or other potential deleterious materials may be utilized or imported to an Owner project site for use as fill or grading material.

B. Exported/Site Generated:

1. Soils: Soils proposed for export shall be tested pursuant to the requirements of the subject section, unless a variance has been requested by Contractor and approved by OEHS prior to the import of the subject materials. Once soils or other materials for export have been tested, they cannot be disturbed or reused for any purpose without prior approval by OEHS.
2. Gravels: Gravels or other natural rock materials shall not be exported from an Owner project site without prior testing by Contractor pursuant to this Section (01 45 24) and/or approval by OEHS. An exception to this provision is gravel adhering to concrete or asphalt pavement. In this instance and in consultation with OEHS, which shall make the final decision, Contractor may dispose of said materials and construction debris without sampling and analytical testing required under this Section.
3. Miscellaneous Material. No miscellaneous material or other similar materials shall be exported from an OWNER project site without prior testing by Contractor pursuant to this Section (01 45 24) and/or approval by OEHS. No crushed miscellaneous material containing concrete, asphalt, construction debris, or other potential deleterious materials that is generated onsite may be used as fill or grading material of any sort at an Owner project site. Crushed asphalt shall be segregated and stockpiled separately. The onsite use of crushing equipment is not permitted.

PART 3 - EXECUTION

3.1 GRADING/EXCAVATION

A. If the Contractor encounters an area with discolored, stained, and/or odorous soils or any other evidence of contamination during excavation/grading work, Contractor must immediately notify the OAR, cease work in the aforementioned area, and secure the area with fencing, tape, stakes or other suitable means to prevent entry by personnel or equipment. In turn, the OAR will immediately notify OEHS, which will initiate a construction response to address the contamination, in accordance with pertinent regulatory requirements.

3.2 SAMPLING AND TESTING

A. Contractor shall contract with, and pay for, the services of a licensed environmental professional, licensed State of California Professional Civil Engineer (PE) or Professional Geologist (PG), to oversee or perform sampling of Materials that are subject to this Section.

B. Contractor shall contract with, and pay for, an independent, approved California Department of Health Services certified testing laboratory to perform testing of imported, exported and site generated fill materials.

C. All fill/grading material, unless otherwise specified in writing by OEHS, whether imported or exported, must be tested at the site of origin. Import/export testing and

certification process shall include the steps listed below. Owner retains the right to refuse any fill material proposed for use at the site.

1. Stockpile all materials for sampling (standard stockpile or backhoe pothole stockpile). Crushed fill materials generated by Contractor at a site must be segregated by material.
2. Submit draft SSP for review and concurrence by OEHS. SSP must include figures identifying the site location, the in situ sampling boundary or stockpile location, the sampling locations, and a brief site history including the type of remedial activity that occurred at the source site, if any.
3. Collect and analyze samples (see Table 1 for number of samples per volume) per the SSP. Samples must include both discrete samples and composite samples.
    a. Discrete samples correspond to a single sample depth at a single sampling/boring location. Discrete samples are to be used for producing composite samples, as described in subparagraph b. below, and for analysis, in accordance with paragraph 3.02.E.1, which applies only to VOCs and TPH-g. For analysis of these compounds, the licensed professional shall collect one discrete sample from each sampling location and samples should be collected at different depths between these locations, so that all stockpile depths are equally represented.
    b. Composite samples correspond to three sample depths from a single sampling location (this includes in situ samples). Each composite sample shall consist of three discrete samples collected near the top, middle, and bottom of the stockpile or in situ boring location at each sampling location. The licensed environmental professional shall then have the analytical laboratory combine the discrete samples into a single composite sample. The laboratory should be directed to retain a sufficient quantity of each discrete sample for further analysis, as necessary. The composite sample shall be analyzed, in accordance with paragraph 3.02.E.2, which describes required testing other than for VOCs and TPH-g. Once materials for export have been stockpiled and tested, they may not be used onsite for any purpose without prior approval by OEHS.
        1) Composite samples with analyte concentrations approximating or exceeding acceptable screening criteria, as specified below in paragraphs F through H, may be attributed to constituents within one or more discrete samples. Analyzing the discretes comprising the composite may reveal the discrete samples with elevated analyte concentrations and, thus, better isolate (and minimize) the volume of soils within the stockpile requiring removal and licensed disposal.
4. Submit draft Soil Certification/Sample Data Report for review and concurrence by OEHS.
5. Submit final Soil Certification/Sample Data Report to the OEHS. All certified material not utilized or exported within a period of 90 days will be subject to retesting unless

a variance is requested by Contractor and is approved by OEHS prior to use or import/export of the subject materials.

6. Submit required pre import/export documentation/record to the OAR and to OEHS, e-mail is acceptable.
7. Submit post import/export certifications to the OAR and OEHS, e-mail is acceptable.
8. In addition to the preceding, requirements, and as necessary or as specified by OEHS, certifications and submittals as indicated in previous articles of PART 3 or in the remainder of this Section may be required.

D. Import/export fill materials shall be samples in situ or stockpiled by Contractor (or at export site) and are deemed acceptable for import/export or reuse only when it is demonstrated to the satisfaction of OEHS that the subject materials meet the requirements of this Section.

E. As described in paragraph 1.04.A.2.b, lacking site-specific data or sample rationale to support a more focused analytical approach; the Contractor shall analyze all samples for the following substances according to the methods indicated below. Table 3 is a waste classification flowchart for use by Contractor's licensed environmental professional. In all cases, detection levels and quality assurance/quality control methods shall be in accordance with standard method reporting limits, best laboratory practices and the following USEPA (EPA) methods for discrete and composite samples:

1. Discrete samples shall be analyzed for Volatile Organic Compounds (VOCs), utilizing EPA Method 8260B/5035 and for Total Petroleum Hydrocarbons (TPH) gasoline (TPH-g), utilizing EPA Method 8015M [with EPA Method 5035 extraction using either volatile organic analysis (VOA) kits, EnCores®, or an equivalent soil collection device].
2. Composite samples shall be analyzed for the following:
    a. TPH, utilizing EPA Method 8015M, for full carbon-chain speciation (including diesel, oil, and other long-chain hydrocarbons).
    b. Polychlorinated biphenyls, utilizing EPA Method 8082.
    c. Semi-Volatile Compounds (SVOCs), utilizing EPA Method 8270C.
    d. Organochlorine Pesticides (OCPs), utilizing EPA Method 8081A.
    e. Organophosphorous Pesticides (OPPs), utilizing EPA Method 8141A.
    f. Chlorinated Herbicides, utilizing EPA Method 8151A.
    g. California Code of Regulations Title 22 (CAM 17) Metals, utilizing EPA Method 6010B/7470A.
    h. Hexavalent Chromium, utilizing EPA Method 7199.
    i. Arsenic/Thallium, utilizing EPA Method 6020.
3. For EPA Method 8270C, a Method Detection Limit (MDL) of 250 ug/kg in addition to the Practical Quantitation Limit (PQL) or equivalent. This requirement is due to a recent DTSC directive requiring MDLs or PQLs to be sufficiently low to detect Carcinogenic Polycyclic Aromatic Hydrocarbons (CPAHs) in the composite sample,

even if these compounds exceed actionable concentrations (900 ug/kg) in only one of the three discrete samples comprising the composite.

4. The certified laboratory may also need to analyze the composite samples for polycyclic aromatic hydrocarbons (PAHs), a component of semi-volatile compounds, if the data evaluation performed in accordance with paragraph 3.02.G of this Section (01 45 24) does not meet DTSC requirements. The analytical methods to be used for this purpose are EPA Method 8270 SIM, if the samples contain relatively high concentrations of hydrocarbons, or EPA Method 8310, if the samples contain low concentrations of hydrocarbons.

F. Import/export fill material may be deemed defective for use by OEHS at the site if any of the following results are obtained:

1. TPH are present at concentrations exceeding 100 milligrams per kilogram (mg/kg) for gasoline and/or 1,000 mg/kg for oil/diesel and long-chain hydrocarbons.

2. Solvents and other VOCs are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
3. PCBs are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
4. SVOCs are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
5. OCPs are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
6. OPPs are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
7. Chlorinated herbicides are present at concentrations exceeding the laboratory reporting limit. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
8. California Code of Regulations Title 22 (CAM 17) Metals at concentrations exceeding site-specific background. Detections between the laboratory reporting limit and the practical quantitation limit (J-flags) should not be reported.
9. Hexavalent chromium is present at concentrations exceeding 300 ug/kg.

G. As mentioned in paragraph 3.02.E, evaluate concentrations of CPAHs, a subset of SVOCs, in the import/export material by conducting the analyses set forth below.

1. Comparing CPAH concentrations with the benzo(a)pyrene [b(a)p] equivalent concentration of 900 ug/kg, the background concentration for CPAHs defined in "A Methodology For Using Background PAHs To Support Remediation Decisions,"

prepared by the Environ Corporation for the Southern California Gas Company and Southern California Edison, January 24, 2002 (referred to as "document"). In this document, CPAHs are defined in Table 2, and Potency Equivalency Factors (PEFs) for each CPAH are listed in Table 3. Using the correct PEF for each CPAH, the licensed environmental professional shall convert the concentration of each CPAH into its b(a)p equivalent concentration. The summation of these b(a)p equivalents for each CPAH must not exceed 900 ug/kg. If CPAHs do not exceed the laboratory reporting limit, then the licensed environmental professional must perform the procedure described above, using the PEF and the laboratory reporting limit (LRL) for each CPAH. The result will be the LRL for each CPAH converted to b(a)p equivalent concentrations. The summation of these b(a)p equivalent concentrations (representing the LRL for each CPAH) must not exceed 900 ug/kg.

H. Evaluate concentrations of metals in import fill by conducting the analysis set forth below.
   1. Compare the maximum detected metal concentrations in import/export material samples to either DTSC or US EPA regulatory action levels, whichever is more conservative. If any metal concentration exceeds its listed regulatory action level, the fill material fails and shall be deemed defective and unacceptable for use.
   2. In addition to paragraph 3.02.G.1, import/export fill shall be deemed defective and unacceptable for use if any of the following results are obtained:
      a. Arsenic concentrations greater than or equal to12.0 mg/kg.
      b. Lead concentration greater than or equal to 80 mg/kg.
      c. Import/Export materials at sites with total lead concentrations greater than or equal to 50 mg/kg shall be analyzed for leachability (STLC) prior to export. Materials exceeding STLC limits identified in Table 2 are deemed defective and unacceptable for use at sites.
      d. Import/Export materials at sites with total chromium concentrations greater than or equal to 100 mg/kg shall be tested for hexavalent chromium.

I. All export/import material shall be characterized, handled, and documented in accordance with applicable US EPA and State of California hazardous waste and hazardous materials regulations (See Table 2). For the purpose of this specification, "contaminated" shall mean any soil or geotechnical material with constituent concentrations, which would require disposal at a regulated facility (i.e., California hazardous waste or RCRA hazardous waste). Refer to Article 3.03 COSTS which outline the disposal fee requirements for excavated contaminated soil. OAR must be notified at least 72 hours prior to the disposal of hazardous waste or hazardous material. No material disposal or reuse can take place without prior written approval of OEHS.

J. Specification test results and OEHS approvals are valid for a period of 90 days from the date of the subject testing unless a variance is requested by Contractor and approved by OEHS. Previously approved materials shall not be utilized or disposed offsite after the 90 day limit without prior review and approval by OEHS.

K. Requests for variances to this Specification Section shall be submitted in writing to OEHS a minimum of two weeks in advance of need for review and approval. The request for a

variance from soil sampling for export must state the following: "The soil for export is less than 10 cubic yards, has no visible staining, is not odorous, and appears native". A photograph of the stockpiled soil must be included in the variance request. The photograph must have a representative scale within it in order for OEHS to determine the volume of soil to be exported. The request for variance must provide all available testing data, and a rationale to support the request. OEHS will review the request for variance and will provide its preliminary determination within 72 hours. Once OEHS approves the variance from sampling, the soil stockpile may be removed as "construction related debris". Certain requests may require final approval by the DTSC.

3.3 TRANSPORTATION

A. Details of the samples and testing must be submitted to and approved by OEHS Environmental Compliance Manager before the materials from which the samples were collected undergo transportation.

B. Haul Routes and Regulations/Restrictions: Contractor must comply with requirements of project environmental disclosure documents (i.e., CEQA EIR) and authorities having jurisdiction over the project area and the proposed activities (e.g. Regional Water Quality Control Board, DTSC, etc.).

3.4 COSTS

A. Contractor shall pay all fees required by authorities having jurisdiction over area.

B. Contractor shall pay all fees for disposal and/or processing of impacted and/or hazardous fill materials at a regulated facility.

C. Contractor shall post and pay for all bonds required by authorities having jurisdiction over area.

TABLE 1: MINIMUM SAMPLING FREQUENCY

Volume (Cubic Yards)*	Sampling Frequency*
0 - 500	1 per 100 CY
501 - 1,000	1 per 250 CY
1,001 - 5,000	1 per 250 CY for first 1000 CY 1 per 500 CY thereafter
> 5,000	12 samples for first 5000 CY 1 per 1000 CY thereafter

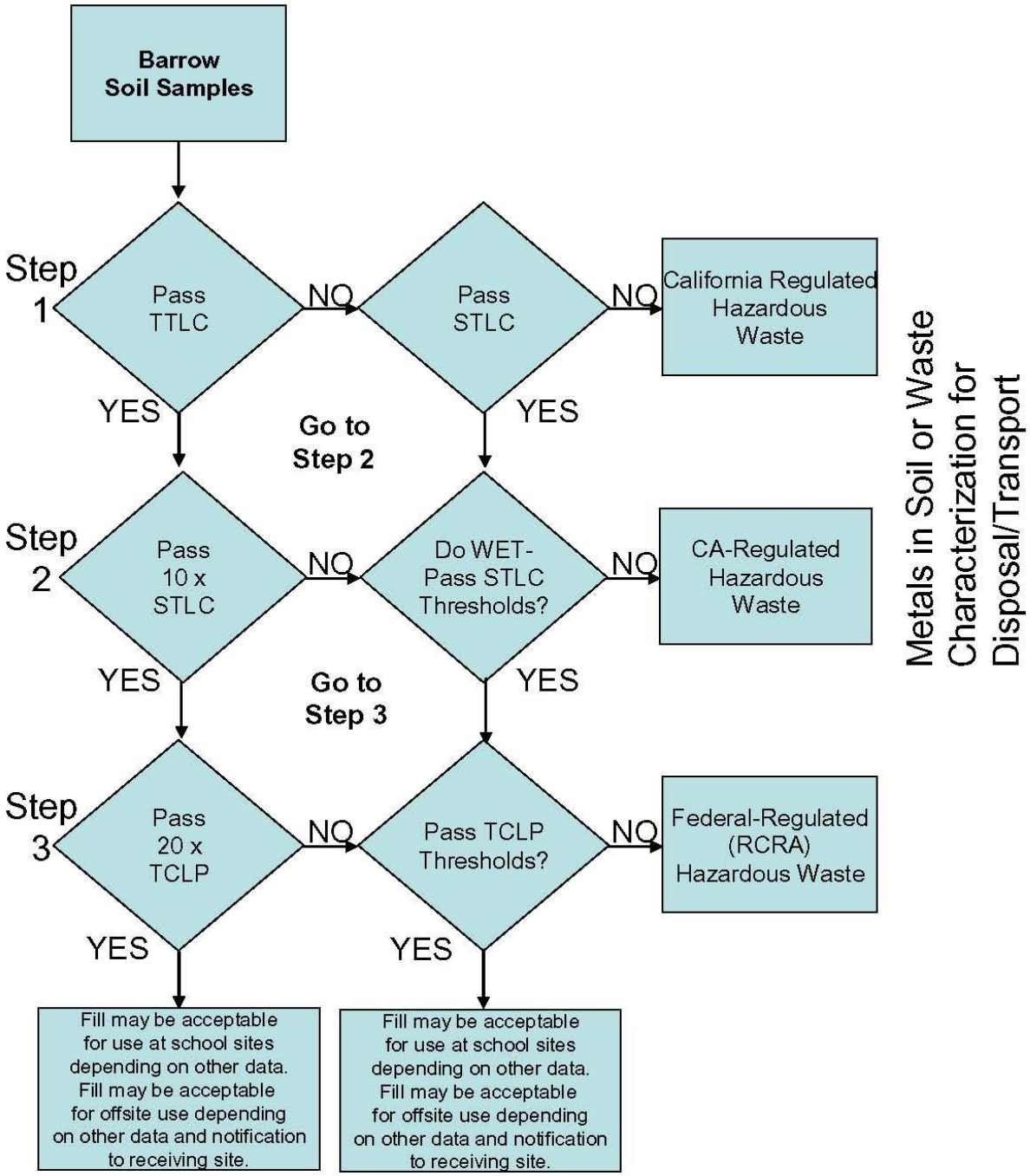
All samples are to be collected, analyzed and accepted before import/export: materials going to licensed facilities must meet sampling criteria from that facility. The rationale for sample approach should be discussed in the draft SSP.

Pothole stockpile sampling may require discrete depth supplemental sampling in order to achieve representative results. The rationale for sample approach should be discussed in the draft SSP. In-situ (in place)

TABLE 1: MINIMUM SAMPLING FREQUENCY	
Volume (Cubic Yards)*	Sampling Frequency*
0 - 500	1 per 100 CY
501 - 1,000	1 per 250 CY
1,001 - 5,000	1 per 250 CY for first 1000 CY 1 per 500 CY thereafter
> 5,000	12 samples for first 5000 CY 1 per 1000 CY thereafter
sampling by mechanical boring or a hand auger method is acceptable if no space exists to store the soil stockpile at the site with prior OEHS approval. *Discuss alternative screening & sampling approaches with OEHS representative for project.	

Chemicals of Potential Concern	TABLE 2 WASTE CHARACTERIZATION				
	Hazardous Waste if Exceed Criteria - TTLC Level* (mg/kg)	Additional WET Leaching Tests if Exceed Hazardous Waste Criteria - 10 times STLC Level** (mg/kg)	California-Regulated Hazardous Waste - Soluble Threshold Limit Concentration - STLC Level (mg/l)	Additional TCLP Leaching Tests if Exceed Hazardous Waste Criteria - 20 times TCLP Level** (mg/kg)	Federally-Regulated (RCRA) Hazardous Waste - Toxicity Characteristic Leaching Procedure - TCLP Level (mg/l)
CAM 17 Metals					
Antimony	500	150	15	NA	NA
Arsenic	500	50	5	100	5
Barium	10,000	1,000	100	2,000	100
Beryllium	75	7.5	0.75	NA	NA

Cadmium	100	10	1	20	1
Chromium	2,500	50	5	100	5



END OF SECTION

DIVISION 02

EXISTING CONDITIONS

SECTION 02 41 19 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. Clearing and removals as indicated on the drawings and specified herein including but not limited to the following:
   1. Protection of existing elements and landscape to remain
   2. Temporary partitions and barricades
   3. Removal of items noted on plans
   4. Stump Grinding

1.2 REFERENCE STANDARDS

A. "Standard Specifications for Public Works Construction" latest edition and amendments thereof.

B. Industrial Safety Orders of the State of California, Division of Industrial Safety.

1.3 GENERAL PROVISIONS

A. Field conditions: Take into consideration as necessary work all obvious existing conditions and installations on the site as though they were completely shown or described. Accept the site of the work as it exists and clear obstructions to the work shown. Field-verify actual locations and tag trees to be removed prior to County approval and actual removal of tree to avoid errors.

B. Examine the site and all conditions and limitations thereon and thereabouts. Take into account all such existing conditions and limitations whether or not the same are specifically shown or mentioned in any of the contract documents and include whatever is needed to complete the work in every part as shown, described, or reasonably required or implied to attain the completed condition contemplated by the contract.

C. Include the reworking of abutting surfaces as required to make new work join and match existing surfaces to remain.

D. Reference drawings may not accurately depict placement of utilities such as water, gas, waste, irrigation, vents, vaults and boxes, and electrical wire conduits on site. Contractor is responsible for any damage done to the existing utilities and damage shall be repaired at the Contractor's expense. Contractor to notify the County 24 hours in advance to inspect and approve any repairs prior to backfilling.

E. Limits of the Work: The indicated items of demolition are not to be construed by the Contractor as a complete list of all the demolition work, but as a guide to the main areas of work involved. Other demolition shall be carried out by the Contractor, at the direction of the County where it is required to complete the project and carry out the intent of the Contract Documents.

1.4 PROTECTION

A. Barricades: Furnish and install a minimum 6' high construction fence to protect public and workmen. Fence shall enclose entire construction area and shall be left in place until removed by contractor after completion of construction.

B. Warning Signs: Adequate warning signs, lanterns, lighting, etc. for vehicular and personnel protection shall be provided and maintained during the period of work as required by applicable safety ordinances.

C. Utilities: preserve in operating condition, unless otherwise noted, all active utilities traversing project site. Repair damage to such utilities caused by work under this contract to satisfaction of owning utility company or agency.

D. Existing work to remain: Provide such forms of protection as may be necessary to prevent damage to existing work and items to remain.

1.5 SITE UTILIZATION

A. Confining of activities: Confine operations to areas indicated so as not to interfere with the functional operation of the street and vehicular traffic.

B. B. Traffic and site entry: Confine equipment and employee traffic pattern designated entry or exit gates as directed by the County.

C. Storage area: Equipment and materials shall be stored on the site or in a secured storage area as designated by the County. Do not store construction materials under canopies of existing trees to remain.

PART 2 - PRODUCTS

2.1 MATERIALS

A. As necessary for the proper completion of this work.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify all items and extent of removal of all items indicated for removal with the County before processing.

B. Reduce or elevate grade of planters and all areas of site work where new construction and/or planting occurs as necessary to accommodate cobble mulch, mulch, topsoil, or turf grass. Meeting grade will be micro-area specific. All planting area grades must be approved by owner or owner representative.

C. Refer to Appendix, Protection of Trees.

3.2 METHODS

A. Within the limits of the construction area, on-site and off-site, clear and remove from the premises all trees specifically indicated for removal per plan, grass, brush, decayed vegetable matter, trunks, large roots, asphalt concrete and concrete pavements, concrete footings and slabs, base material and all other material indicated for removal on plans.

B. Refill depressions excavated below grade for the removal of objectionable materials with suitable materials compacted to a relative density of 90% or more in accordance with ASTM D1557-70.

C. Refill any depression within the park to re-establish a grade 3" below the top of planter, or other adjacent surface with suitable growing soil medium. Refill after soil settling and watering as necessary to meet requirements. Turf areas will require backfill with suitable topsoil to grade prior to reseeding.

D. Concrete and bituminous surfacing to be removed shall be removed to the limits indicated or required, and shall be disposed of off the site. All cutting shall be done to a neat and even line with proper tools or a concrete cutting saw. Any concrete broken beyond the indicated limits shall be removed to the nearest joint or score line and then replaced with new concrete to match the existing at the Contractor's expense.

E. Crushed Concrete:

1. Break up and completely remove all existing concrete surfacing, curbs, gutters, walks and bituminous surfacing indicated to be removed. The Contractor shall haul the material and disposing of it off the site. Crushed materials may not be incorporated in fill areas.

F. Tree Removal:

1. All removals as specified in Section 31, “Selective Tree and Shrub Removal”.

3.3 CLEAN-UP

A. Site: all debris resulting from the work of this section, together with all tools, equipment, and appliances used shall be completely removed from the site upon completion of the work.

END OF SECTION

SECTION 02 41 20 – 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 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 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 10 00 – CONCRETE FORMWORK

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Provide the finish work of this Section as indicated on drawings and specified herein and needed for a complete proper installation.

B. Provide and secure formwork, ties, shoring, bracing, anchorage and blockouts.

C. Related Requirements: The General Provisions of the Contract Documents affecting the work of this Section includes but not necessarily limited to General Conditions, Supplementary Conditions and Sections of Division 1 of the Project Manual.

1.2 RELATED WORK

A. Site work.

B. Reinforcing.

C. Cast-in-place concrete.

D. Masonry

1.3 QUALITY ASSURANCE

A. Construct and erect formwork in accordance with ACI 318, 347 and as required indicated on Structural Drawings.

B. Design forms and falsework to adequately support live and dead loads, including equipment, concrete drops, pressures of foundations, etc.

1.4 CODES AND STANDARDS

A. Title 24, Part 2, C.C.R., 2013 C.B.C.

B. Follow recommendations of ACI 318 and 347.

1.5 ARCHITECT REVIEW

A. Architect will review for general architectural applications only. Design of formwork for structural stability and sufficiency is the sole responsibility of the workers and contractors.

PART 2 - PART 2 - PRODUCTS

2.1 EARTHEN FORMS

A. Provide earthen forms as indicated on drawings only for footings where the soil is firm and stable and the concrete will not be exposed, and as approved or directed. Cut earthen forms square, neat and accurate to size. Clean bottoms of excavations.

2.2 WOOD FORMS

A. Provide APA Plyform of B-B Class I exterior, high density overlaid one side for forms, sound, undamaged, and clean, 5/8 inch thick minimum.

2.3 LUMBER

A. Provide douglas fir, construction grade lumber for forming, studding and bracing.

2.4 ACCESSORIES

A. Provide nails, spikes, lag bolts, through bolts and anchorages required, of sufficient strength, length and character to maintain formwork during pouring operations.

B. Use snap-off, removable, or adjustable type metal ties. All metal is to be hot-dip galvanized. Provide standard metal form clamp assembly spreader type, leaving no metal within 1 inch of concrete exposed face. Leave inner tie rod within concrete when forms are removed.

C. Provide colorless mineral oil type form coating, non-grain raising and non-staining type, Noxcrete's Non-Crete Form Coating, Arcal Chemical's Arcalo 80, Industrial Synthetic's Synthex, or other approved.

D. Rigid foam plastic fillets may be used for chamfered corners.

2.5 FORMED CONSTRUCTION JOINTS

A. Provide galvanized steel or extruded plastic tongue and groove type, with knock-out holes at 6 inches on centers.

2.6 DOVETAIL ANCHOR SLOTS

A. Provide minimum 24 gage galvanized steel foam filled type, with release tape sealed slots, bent tab anchors, securable to formwork.

2.7 COLD JOINTS

A. Provide standard metal keyed dividers for cold joints, subject to approval.

2.8 ANCHORS AND HANGERS

A. Use anchors which do not leave exposed metal at surface.

PART 3 - PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencing work, inspect the work of others and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section.

3.2 FORMING

A. Earthen forms: Foundation concrete may be placed directly into neat excavations provided the foundation trench walls are stable as determined by the architect and Geotechnical Engineer, subject to the approval of the Division of the State Architect. In such case, the minimum formwork shown on the drawings is mandatory to insure clean excavations immediately prior to and curing the placing of concrete. Trench earthen forms at least two inches wider than footing widths shown on drawings. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from caving. Form sides of footings where earth caves. Tamp form and clean all debris and loose materials in earthen forms before depositing concrete.

B. Design forms and shoring to resist all anticipated loads.

C. Verify accuracy of lines, levels, and centers.

D. Construct formwork and appurtenances to meet design and code requirements. Construct of sound materials, of correct shape and dimensions, mortar tight and of sufficient strength to prevent sagging, buckling, movement and failures. Provide adequate shores of wood or metal to safely carry imposed loads and adjustable to prevent displacements during the work.

E. Align joints and make them watertight.

F. Set reinforcing accurately and ensure secure placement.

G. Maintain tolerances of ACI 347, within 1/8 inch in 10 feet.

H. Assist in setting and placing blockouts and sleeves for materials and products to be embedded in and passing through concrete. Comply with CCR Title 24 Section 1906.3.

I. Provide ports and openings to facilitate inspection and cleaning.

J. Chamfer all corners 1 inch unless shown otherwise.

K. Set screeds and establish levels for tops of concrete for finish surfaces. Shape surfaces as indicated on drawings.

L. Screed supports for concrete over waterproof membranes or vapor barriers should be of a cradle, pad, or base type which will not puncture membrane.

M. Wet formwork prior to placing concrete and keep wet during concrete curing process.

3.3 FORM REMOVAL

A. Do not remove formwork, shoring and bracing until such time as masonry and concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon it. Verify strengths by compressive strength test results. Loosen forms carefully. Do not wedge pry bars, hammers or other tools against masonry and concrete surfaces. Comply with Section 1906.2, Title 24.

B. The following are minimum times for forms and shoring to remain in place prior to removal:
   1. Footings and grade beams - 1 days.
   2. Walls and columns - 2 days.
   3. Beam sides - 3days.
   4. Beam and slab soffits – 3 days.

C. Cut nails and form ties off flush and leave all surfaces smooth and clean.

D. Forms shall not be removed from concrete that is still “green”, i.e. the concrete is still moist.

END OF SECTION 03 10 00

SECTION 03 11 16 – ARCHITECTURAL CONCRETE FORMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood architectural concrete formwork.
   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 SECTION REQUIREMENTS

A. Delegated Design Requirements:
   1. Formwork Design Requirements: Specified in Section 03 30 00.
   2. Mix Design Requirements: Specified in Section 03 30 00.

B. Submittals: Submit product data, shop drawings, and delegated design submittals.

C. Quality Standard Requirements:
   1. Formwork Materials: Comply with the requirements of ACI publication ACI 303R, "*Guide to Cast-in-Place Architectural Concrete Practice*".

PART 2 - PRODUCTS

2.1 LUMBER

A. Full-Dimension Lumber: "#1" or "#2" grade Douglas conforming to WCLIB Grading Rules, S4S, dried to a moisture content of not more than 19 percent, and stamped "S-DRY".

B. Kiln Dried Lumber: Kiln-dried lumber (KD) is prohibited. (unrelieved stresses from increased density, cell shrinkage, brittleness, etc. caused by rapid drying can cause wood to twist, turn, cup, bow, or warp in or on the form when moisture is reintroduced into formwork under pressure during concrete placement)

2.2 WOOD PANELS

A. Plywood:
   1. Description: APA Sanded Grade B-B EXT. All panels must bear a visible APA grade mark.

2. Requisite Properties:
    a. Thickness: At least 3/4-inch nominal thickness, unless otherwise indicated.
    b. Construction: At least 7-layer (7-ply), unless otherwise indicated.
    c. Panel Edges: Tongue-and-groove, unless otherwise indicated.
    d. Concrete Finish: Prominent wood grain.

B. Medium Density Overlay (MDO) Panels:
    1. Description: 64/30 MDO consisting of one layer of 64#/MSF MDO phenolic impregnated fiberboard overlaid with one layer of 30#/MSF MDO phenolic fiberboard on back
    2. Application: Soffit deck forms only.
    3. Product: “Readyform 3323” manufactured by Arclin, Inc., or equal.
    4. Concrete Finish: Matte finish; some wood grain transfer.

C. High Density Overlay (HDO) Panels:
    1. Description: 100/30 HDO consisting of at least one layer of 100#/MSF HDO phenolic fiberboard on the face and one layer of 30#/MSF HDO phenolic fiberboard on back.
    2. Application: Walls, columns, girders and soffits.
    3. Product: “Readyform 2252” manufactured by Arclin, Inc., or equal.
    4. Concrete Finish: Gloss finish; minimal wood grain transfer.

2.3 ACCESSORIES

A. Form Spreaders: Metal with plastic-covered tips at each end.

B. Fiberglass Form Tie Rods:
    1. Description: Factory-fabricated, glass-fiber-reinforced plastic ties designed to resist lateral pressure of fresh concrete on forms, and to prevent spalling of concrete on removal.
    2. Products: “SuperTie Fiberglass Form Tie System” manufactured by RJD Industries, Inc., or equal.
    3. Requisite Properties:
        a. Type: Provide ties with integral water-barrier plates for walls indicated as receiving dampproofing or waterproofing.
        b. Resin: Polyester.
        c. Size: 1/2-inch in diameter; grey color.

C. Form Coatings and Sealers: Provide the following manufactured by Nox-Crete Products Group, or equal.
    1. Low Build Form Sealer: “Clear Pre-Form” pigmented polyurethane wood sealer, or equal.
    2. High Build Form Sealer: “Pre-Form HB” transparent polyurethane wood sealer, or equal.
    3. Edge Sealer: “Edge-Flex 645” edge sealer with form release agent, or equal.

D. Form Release Agent: “Nox-Crete PCE” manufactured by Nox-Crete Products Group, or equal.

E. Fasteners: Uncoated stainless steel screw fasteners. Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and blots, and other suitable fasteners designed to withstand in-service loads.

F. Sealant:
   1. Description: Single component polyurethane sealant conforming to ASTM C 920 requirements for Type S, Grade NS, Class 100/50, Use T, NT, M, G, A or O sealant, as applicable.
   2. Product: “Sikaflex 15LM” manufactured by Sika Corp., or equal.
   3. Color: Selected by the Architect from the manufacturer’s standard colors.

G. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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. Securely attach formwork in place to supporting construction.
   3. Install formwork using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
      a. Set formwork true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
      b. Securely attach formwork in place to supporting construction.

B. Special Techniques:

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged, and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

4. Installed formwork must be warrantable. Do not install, correct, or replace any formwork in a manner that is un-warrantable by the manufacturer or that results in any other specified or other warranty or guarantee becoming void.

D. Protection:
   1. Protect installed formwork in place from soiling, deterioration, and damage until Substantial Completion.
   2. Do not store anything on or adjacent to or against installed formwork unless it is or they are protected from damage, as accepted in writing by the manufacturer's representative. Do not use installed formwork surfaces as work surfaces.
   3. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 03 20 00 – CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide reinforcing steel bars, welded wire fabric, support chairs, bolsters, bar supports and spacers as indicated on the drawings as specified herein and needed for a complete and proper installation.

B. Related Requirements: The General Provisions of the Contract Documents affecting the work of this Section to include but not necessarily limited to the General Conditions, Supplementary Conditions and Sections of Division 1 of the Project Manual.

1.2 RELATED WORK

A. Site Concrete.

B. Formwork.

C. Cast-in-place concrete.

D. Concrete Unit Masonry.

1.3 QUALITY ASSURANCE

A. Perform reinforcing work in strict conformance with CRSI unless specified otherwise or required otherwise by local code jurisdiction.

1.4 CODES AND STANDARDS

A. Title 24, Part 2, C.C.R., 2013 C.B.C., Chapter 19A and applicable Sections.

B. In addition to CRSI specifications, follow ACI 315 and 318, AWS welding codes and qualifications, and ASTM A185, A305, A615, and A706.

C. Testing of bars in accordance with Title 24, Part 2, C.C.R., 2013 C.B.C. Section 1903A and 1913A.2.

1.5 TESTING

A. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided the mill analyses accompany the report,

then one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction, of each size of reinforcing steel.

B. Where positive identification of the heat number cannot be made or where random samples are to be taken, then one series of tests shall be made from each 2-1/2 tons or fraction, of each size of reinforcing steel.

C. Comply with Title 24, Part 2, C.C.R., 2013 C.B.C., Chapter 17A & Section 1913A.2.

D. Comply with Section 01 25 43 of Division 1.

1.6 STORAGE

A. Do not allow reinforcing materials to have direct contact with the ground. Cover materials adequately to prevent rusting, and contact with materials or construction injurious to proper bonding.

PART 2 - PRODUCTS

2.1 REINFORCING BARS

A. Deformed billet steel bars, ASTM A615, plain finish, see drawings for grade. ASTM A706 for bars to be welded, and elsewhere as defined on drawings.

2.2 WELDED WIRE FABRIC

A. Provide plain type, ASTM A185, in coiled rolls, or flat sheets, plain finished, void of rust, dust, scale, paint, grease and other coatings, conforming to UBC Standard 19-1.

2.3 ACCESSORIES

A. Provide minimum 16 gage galvanized annealed tie wires, and chairs, bolsters, bar supports, and spacers sized and shaped for strength and support of reinforcing. Plastic accessories may be acceptable if approved by Architect prior to use.

2.4 FABRICATION AND MANUFACTURE

A. Fabricate in accordance with details shown.

B. Accurately bend, cut and place bars as shown on drawings. Bend bars cold; heating of bars is not permissible. Do not bend or straighten bars in any manner that will injure materials. Comply with Title 24, Section 1907A.2 and 3.

C. Welding: All welded reinforcing steel shall be A.S.T.M. A706. Perform welding, where shown or approved, by the direct electric arc process in accordance with AWS D1.4

using 90 series low hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during cooling process; accelerated cooling is prohibited. Do not tack weld bars. Clean metal surfaces to be welded of all loose scale and foreign materials. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds found defective, with chisel, and replace with proper welding. Comply to Title 24, Section 1903A.7.

1. Employ only experienced AWS certified welding operators.
2. Prequalification of welds are to be in accordance with code and carbon equivalent of reinforcing not exceeding 0.75.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencing work of this section, inspect work of others and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section. Inspection of welding shall be done by a special inspector approved by D.S.A., services retained and paid for by the Owner.

3.2 INSTALLATION

A. Fabricate reinforcing in accordance with ACI 315. Locate reinforcing splices not shown on drawings, at mid span. Where shown or required, weld reinforcing bars in accordance with AWS D1.4 (1989).

B. Place reinforcing supported and secured against displacement. Do not deviate from true alignment.

C. Ensure that reinforcing used is clean, free of scale, dirt, dust, rust and other matter.

D. Provide a minimum splice for bars noted as "cont.", typical wall reinforcing, no splices in concrete column reinforcing. Provide a standard lap of 48 bar diameters in masonry and 36 bar diameters in concrete, and in no case less than 24 inches. Wire all laps and splices in welded wire mesh and provide side and end laps of at least 8 inches.

1. Spacing - minimum center-to-center distance between parallel reinforcing bars is to be in compliance with that shown on drawings, or in the absence of such

information on drawings, the clear spacing is to be 1-1/2 bar diameter, but in no case less than 1-1/2 inch, nor 1-1/3 times the maximum size of aggregate.

2. Where possible, stagger splices of adjacent bars.

E. Only splice reinforcing where shown or noted. Splices at other locations must be approved by the Architect or Structural Engineer. Provide continuous reinforcement between splice locations in vertical walls. No splices of vertical wall reinforcing may occur except at foundations, unless specifically approved by the Architect or Structural Engineer.

1. Securely tie reinforcing with 16 gage tie wire at all splices and intersections, and as may be directed.

2. Point ends of wire ties away from forms.

F. Stagger splices in adjacent horizontal wall reinforcing bars a minimum of 4 feet.

G. Provide dowels in footings and/or grade beams the same size and number as vertical wall or column reinforcing. Provide a minimum dowel protection equal to standard lap splices unless noted otherwise.

1. Secure tie dowels in place before depositing concrete. Install No. 3 bars for securing dowels where no other reinforcement is provided.

H. Provide the minimum coverage of reinforcing by concrete:

I. Below grade (unformed) 3 inches clear

J. Below grade (formed) 2 inches clear

K. Walls 2 inch clear

L. Columns, beams 2-1/2 inches clear

3.3 CORRECTION DURING CONCRETING

A. Maintain capable steel workers during placement of concrete for properly resetting reinforcement displaced by runways, workers, or other causes.

3.4 DEFECTIVE WORK

A. The following reinforcing work will be considered defective and may be ordered by Owner to be removed and replaced at no additional expense to Owner.

1. Bars with kinks or bends not shown on drawings.
2. Bars injured due to bending or straightening.
3. Bars heated for bending.
4. Reinforcement not placed in accordance with drawings or specifications.
5. Rusty or oily reinforcement.
6. Re-bent bars.

3.5 INSPECTIONS

A. 48 hours prior to pouring concrete, notify the architect, structural engineer and D.S.A. that reinforcing is ready for inspection. Secure approvals by testing laboratory and inspector before concrete operations are commenced.

END OF SECTION 03 20 00

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. General Provisions apply to this section.

B. Section Includes:
   1. Cast-in-place concrete placement and finishing.

C. Related Sections:
   1. Section 30 10 00: Concrete Forms and Accessories.
   2. Section 03 20 00: Concrete Reinforcement.

1.2 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.

B. Product Data:
   1. Mix Design: Submit a concrete mix design for each mix that will be provided for the Work. Include water/ cement ratio, size of coarse aggregate and amount of any admixture. Predict minimum compressive strength, maximum slump and air content percentage.
   2. Manufacturer of ready-mixed concrete shall deliver to the ior a certificate with each mixer truck. Certificate shall bear the signature of representative of the testing laboratory, and shall state quantity of cement, water, fine and coarse aggregate and admixtures.

C. Material Samples: Submit Samples illustrating concrete finishes, minimum 12 inches x 12 inches in size.

D. Certificates: Submit a notarized certificate that each of following conforms to standards indicated:
   1. Aggregates – ASTM Standards C33
   2. Admixtures - ASTM Standards C260
   3. Curing materials - ASTM Standards C171

1.3 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement.

B. American Concrete Institute (ACI) Publication:
   1. ACI 211 - Recommended Practice for Selecting Proportions of Concrete.

2. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
3. ACI 305 - Recommended Practice for Hot Weather Concreting.
4. ACI 306 - Recommended Practice for Cold Weather Concreting.
5. ACI 308 - Recommended Practice for Curing Concrete.
6. ACI 309 - Recommended Practice for Consolidation of Concrete.

C. American Society for Testing and Materials (ASTM) Standards:
1. ASTM A 185 - Welded Steel Wire Fabric For Concrete Reinforcement.
2. ASTM C 31 - Making and Curing Concrete Test Specimens in the Field.
3. ASTM C 33 - Concrete Aggregates.
4. ASTM C 39 - Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C 88 - Soundness of Aggregates by use of Sulphate or Magnesium Sulphate.
6. ASTM C 94 - Ready-Mixed Concrete.
7. ASTM C 143 - Slump of Hydraulic Cement Concrete.
8. ASTM C 150 - Portland Cement.
9. ASTM C 171 - Sheet Materials for Curing Concrete.
10. ASTM C 172 - Sampling Freshly Mixed Concrete.
11. ASTM C 173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
12. ASTM C 227 - Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
13. ASTM C 231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C 260 - Air-Entraining Admixtures for Concrete.
15. ASTM C 289 - Potential Reactivity of Aggregates (Chemical Method).
16. ASTM D 1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

D. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

E. Inspection shall be performed by a representative of a testing laboratory selected by the Owner. Owner will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

F. Continuous batch plant inspection requirement may be waived in accordance with CBC section 1929 A. 5. Waiver shall be in writing, including DSA approval.

G. Strength Test of Concrete: Refer to Section 01 45 23: Testing and Inspection.

1.4 DELIVERY, STORAGE AND HANDLING

A. Mixing and Placing Concrete: Refer to Section 01 45 23: Testing and Inspection.

B. Ready-mix concrete shall be mixed and delivered in accordance with ASTM C 94 and CBC Standard 19-3 and 19-4. Each batch of concrete delivered to the Project site shall be accompanied by a time slip bearing departure time and signature of batch plant supervisor. Concrete shall be placed within 90 minutes after start of mixing.

C. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

1.5 JOB CONDITIONS

A. Cold Weather Requirements:

1. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. Surfaces, in which concrete is to come in contact with, shall be free from frost or ice. No frozen materials or materials containing ice shall be furnished.
2. When placing concrete during freezing or near-freezing weather the mix shall have a temperature of at least 50 degrees F., but not more than 90 degrees F. when cement is added. Concrete shall be maintained at a temperature of at least 50 degrees F. for at least 72 hours after placing or until it has thoroughly hydrated. When necessary, concrete materials shall be heated before mixing. Special precautions shall be provided for protection of transit-mixed concrete.

B. Hot Weather Requirements:

1. During hot weather, proper attention shall be provided for ingredients, production methods, handling, placing, protection and curing, to prevent excessive concrete temperatures or water evaporation which could impair required strength or durability.

PART 2 - PRODUCTS

2.1 GENERAL

A. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of CBC Chapter 1905A.

B. Strength of Concrete: Concrete, unless otherwise indicated or specified, shall be provided with a minimum ultimate 28-day strength of 3000 psi (f'c). For high-early-strength concrete, age for reaching the f'c shall be as indicated on Drawings.

2.2 MATERIALS

A. Cement: ASTM C 150. Furnished cement shall be as selected and reviewed for concrete proportioning.

B. Aggregates: Aggregates shall conform to ASTM C 33 and C 227 except as modified herein. Any suitable individual grading of coarse aggregate may be

furnished, provided Grading of Combined Aggregate indicated in following table is obtained. Refer to Section 01 45 23: Testing and Inspection.

GRADING OF COMBINED AGGREGATE			
SIEVE SUMBER OR SIZE IN INCHES	*1-1/2" MAXIMUM MAXIMUM*	*1" MAXIMUM*	*3/4"*
Passing a 2"	------	------	------
Passing a 1-1/2"	95-100	------	------
Passing a 1"	70-90	90-100	------
Passing a 3/4"	50-80	70-95	90-100
Passing a 3/8"	40-60	45-70	55-75
Passing a No. 4	35-55	35-55	40-60
Passing a No. 8	25-40	27-45	30-46
Passing a No. 16	16-34	20-38	23-40
Passing a No. 30	12-25	12-27	13-28
Passing a No. 50	2-12	5-15	5-15
Passing a No. 100	0-3	0-5	0-5

C. Water: Water shall be potable and free from deleterious matter.

D. Admixtures: CBC Chapter 19A, Section 1903A.6, Type A or D.

E. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D 1751.

F. Curing Paper and Liquid Curing Compounds:

1. Curing Paper: A standard brand conforming to ASTM C 171, Type 1 - Regular, Kure-N-Seal.
2. Liquid Curing Compounds: A standard brand, clear liquid conforming to ASTM C 309, Master Builders, Grace, Antihydro.

G. Abrasive Aggregate: Norton Alundum, Union Carbide Carborundum, or equal, graded #12 through #30 sizes, color as selected by Architect.

H. Underlayment: Latex underlayment for filling low spots in concrete shall be Tile-Tex by Flintkote Co., Webtex #60 or Fixallatex by Dowman Products Co.

I. Vapor Barrier: ASTM D 2103, polyethylene sheeting, clear, 10 mils minimum thickness, impact strength greater than 70 grams per mil, 10 feet minimum width. Provide minimum 2-inch wide waterproof plastic self-adhering tape for sealing edges and ends of sheeting.

1. Moisture barrier is required where an interior area is scheduled to receive moisture sensitive floor finishes.

J. Stair Strips and Nosing:

1. Fabricated from 6063-T5 extruded aluminum, mill finish. Anti-slip filler shall contain at least 60 percent virgin grain aluminum oxide abrasive. Binder shall be fully cured resilient type epoxy, with binder-to-filler ratio of 13 percent. The epoxy-abrasive filler shall extend over the curved front edge of the nosing and shall be securely bonded to the extruded aluminum base.
2. Manufactured by Wooster Products Inc. American Safety Tread Co. Inc., or equal.
3. Nosing and strips for concrete casting shall be provided with Sure-Hold anchors, chevron shaped continuous full length of nosing or strip.
4. Nosings and anchors for attachment to hydrated concrete stairs and wood stairs shall be similar to those specified below, except they shall be provided with countersunk holes for screws and fasteners.
5. Colors: As selected by Architect to contrast with stair color. Colors shall extend uniformly through the filler.
6. Strip and Nosing Types:

    a. Nosings for sloped riser steel pan stairs: Type WP4J, 4-1/16 inches wide, 3/8 inch thick.
    b. Nosings for new concrete stairs: Type WP4C, 4-1/16 inches wide, 3/8 inch thick, nose projects down 1/4 inch.
    c. Nosings for square edged steel pan stairs: Type WP4SP, 4-1/16 inches wide, 3/8 inch thick nose.
    d. Strips for recessing into concrete stairs: Type WP1A, except 2-1/4 inches wide, 3/8 inch thick. American Safety Tread Co., Type 24, or equal.
    e. Strips for adhering to existing or hydrated concrete: Flex-Tred anti-safety strips, minimum 2-1/4 inches wide. Cut from rolls and round corners.
    f. Strips for anchoring into wood or stone: American Safety Tread Co., Type 24H, or equal, with holes for fasteners, 2-1/4 inches wide.

PART 3 - EXECUTION

3.1 GENERAL

A. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the IOR at least 24 hours before placing concrete; do not place concrete until inspected by the IOR.

B. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the Architect and DSA.

3.2 PREPARATION

A. A Moisture Barrier: Before installation of screeds and slab reinforcement, install a moisture barrier under slabs on grade. Place membrane in as large sheets as possible, lapped 12 inches at sides and ends, with top lap placed in the direction of the spreading of concrete. Extend membrane and lap at least 4 inches onto adjoining wall surfaces and seal with pressure-sensitive tape.

1. Install moisture barrier on minimum 2-inch bed of sand, unless otherwise indicated, over gravel base as indicated on the Drawings.
2. Patch punctures and tears in moisture barrier.

B. B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.
2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Anchor Slots: Dove-tail anchor slots at concrete walls to receive masonry veneer shall be set vertically in forms, 24 inches maximum on centers measured horizontally. Anchor slots shall be No. 24 gage galvanized sheet steel with removable fiber filler to prevent seepage of cement in slot.

D. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.3 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the IOR. Do not place concrete outside of regular working hours, unless the IOR has been notified at least 48 hours in advance.
2. Concrete shall be conveyed from mixer to location of final placement by methods, which will prevent separation or loss of materials.
3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.

4. In placing concrete in thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.
5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.
6. Concrete shall be thoroughly consolidated during placement, and shall be worked around reinforcement and embedded fixtures with mechanical vibrators.
7. Where conditions make consolidation difficult, or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Compaction and Screeding:
1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.
2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

C. Floating and Troweling:
1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.
2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within a tolerance of 1/8 inch in 10 feet. Avoid burnishing. Do not add cement or sand to absorb excess moisture.
   a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.
   b. At gymnasium locker room floors shall be given a fine broom finish. After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.
3. Exterior Paving and Cement Walks: Finish as specified above, except surface shall be given a non-slip broom finish to match Sample reviewed by the Architect.
4. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

D. Curing:
   1. Concrete shall be maintained above 50 degrees F., and in a moist condition for 7 days after placing, except that high early strength concrete shall be maintained in a moist condition for 3 days.
   2. Before applying curing paper, interior floor treated with colored hardener shall be given a heavy protective coat of colored wax left unpolished, and then immediately covered with paper. If wax is not applied within two hours after final troweling, concrete shall be sprayed with a fine water mist and maintained continuously moist until wax is applied, unless spraying is not recommended by hardener manufacturer. After other Work such as plastering and painting has been completed, curing paper shall be removed and waxed floors cleaned of protective wax coating.
   3. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.
   4. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.
   5. Immediately after finishing, roof slabs and monolithic floor finish to receive resilient floor covering shall be uniformly and completely coated with liquid curing compound.
      a. Install compound in a manner and quantity sufficient to produce a uniform continuous thin film of water-impervious membrane. Compound shall be installed in accordance with manufacturer's directions.
      b. Protect adjoining surfaces from damage during installation. If curing compound is not applied immediately, cover finished concrete with wet burlap or curing paper and keep concrete surface wet for a period not to exceed thirty hours following finishing of concrete. At end of that time, burlap or paper shall be removed and curing compound installed as specified above.
   6. Immediately after finishing, monolithic floor slabs not scheduled to receive resilient floor covering shall be covered with curing paper. Paper shall be lapped 3 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.
   7. Within 24 hours after finishing, exterior slabs and paving, and interior slabs to receive cement topping or mortar setting beds, shall be covered with sand to a depth of 2 inches and kept thoroughly wet for 7 days.
      a. Instead of sand covering, exterior walks and paving where no other surface treatment is specified, may be cured with clear liquid curing compound immediately installed in accordance with manufacturer's directions.

E. Filling, Leveling and Patching:

1. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.
2. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

F. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.4 FINISHING

A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.

1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.
2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.

C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.

D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish. Abrasive grains in amount of 30 pounds per 100 square feet shall be evenly installed by dust-on method and embedded into surface during first

troweling operation. Additional abrasive grains, in amount of 30 pounds per 100 square feet, shall then be evenly installed and embedded into surface during final troweling operation.

E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener, as specified. Install hardener after surface of concrete has reached the point where no excess moisture is present, but while it is still plastic. Hardener shall be installed as follows:
   1. Colored Hardener: Install at rate of 40 pounds per 100 square feet of surface for initial application.
   2. Gray (natural) Hardener: Install at rate of 20 pounds per 100 square feet of surface for initial application.
   3. Hardener shall be evenly distributed and thoroughly floated into surface mortar with a wood float. An additional 20 pounds of hardener, colored or gray, specified as above, shall be installed over each 100 square feet, and troweled to an even surface having uniform color and texture.

F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.

G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.5 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:
   1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.
   2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.
   3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.6 TESTING

A. Molded Cylinder Tests:
   1. Owner Consultant will prepare cylinders. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.
   2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of 3 days, 7 days, and 28 days. A strength test shall be the average of the compressive strength of 2 cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.
   3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C 31, and tested in accordance with ASTM C 39.

B. Core Test: At request of the Architect, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C 42.
   1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the Architect.
   2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.
   3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C 143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, fall below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Defective Concrete:
   1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the Architect and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

F. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall be 3,000 psi concrete. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 30 10 00: Concrete Forms and Accessories, and reinforced as described in Section 03 20 00: Concrete Reinforcement. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch to 1 inch aggregate as specified for concrete mix.

3.7 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.8 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION 03 30 00

SECTION 03 35 10 – CONCRETE FLATWORK FINISHING AND CURING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Finishing flatwork after strike off, including leveling, floating, troweling; and other concrete finishing methods, including finishing tolerance classifications.
   2. Evaporation reducers.
   3. Curing compounds.
   4. Preventative (day-of-pour) MVECS.
   5. Floor hardeners.
   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 SECTION REQUIREMENTS

A. Regulatory Requirements:
   1. Portland cement concrete paving must be stable, firm, and slip resistant and must conform to California Building Code Sections 11B-302 and 11B-403.

B. With input from the preventative (day-of-pour) MVECS manufacturer, preventative MVECS specified in this specification section may be considered for certain concrete curing applications in lieu of curing compounds; and possibly in lieu of corrective (remedial) MVECS products specified in Section 09 05 16.

C. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing concrete sealers installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Concrete Finishers: Company or individuals must have at least 5 years' experience installing concrete sealers for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing concrete sealers for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading concrete sealers installers.
      a. Only ACI-certified Flatwork Technicians and Finishers are qualified to supervise or perform any of the work of this specification section.

b. Verify proposed finishing supervisors and finishers designated to either supervise or perform any of the work of this specification section have passed ACI certification tests and are current in their certification.
c. If any proposed finishing supervisor or finishers designated to either supervise or perform any of the work of this specification section require re-certification, then cause the re-testing of those finishers prior to beginning the work of this specification section.

D. Submittals: Submit product data and written descriptions of specified qualifications.

E. Preinstallation Meeting:
1. Hold a meeting after submittal approval and at least 10 business days before beginning installation.
a. VDR manufacturer's representative and installer must attend meeting.
b. Concrete finishers and the evaporation reducer, surface retarder, slip-resistive aggregate, floor hardener, curing compound, and MVECS manufacturers' representatives must also attend the meeting.
c. Tiling and flooring manufacturers' representatives and installers must attend the meeting.
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
a. Review, discuss, and complete the National Ready Mixed Concrete Association and American Society of Concrete Contractors publication NRMC/ASCC, "*Checklist for the Concrete Pre-Construction Conference*" during the course of the pre-installation meeting. (available from www.nrcma.org or www.ascconline.org)
b. Discuss the use (or not) of maturity testing for this project, including development of the maturity calibration curve and the equipment requirements and sensor placement for measuring in-place concrete maturity.
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 flatwork. 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.

F. 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.

G. With input from the preventative (day-of-pour) MVECS manufacturer, preventative MVECS specified in this specification section may be considered for certain concrete curing applications in lieu of curing compounds; and possibly in lieu of corrective (remedial) MVECS products specified in Section 09 05 16.

PART 2 - PRODUCTS

2.1 EVAPORATION REDUCERS (EVAPORATION RETARDANTS)

A. Description: VOC-compliant water-based polymer liquid that forms a thin continuous film when applied to fresh concrete, which controls the flatwork surface conditions until finishing operations cause the thin film to completely dissipate.
   1. Evaporation reducers are not curing compounds. Concrete treated with evaporation reducers must be cured.
   2. Evaporation reducers are not surface retarders.

B. Applications: Used on surfaces of newly-placed concrete to temporarily reduce rapid moisture loss from flatwork due to any of the following conditions and applications.
   1. High temperature.
   2. Low humidity.
   3. High wind.
   4. Direct sunlight.
   5. Indoor applications heated in winter.
   6. Low water-cement ratio concrete applications.
   7. Concrete mixes indicated as containing either super plasticizers or silica fume.

C. Restrictions: Do not apply evaporation reducers during final troweling operations. (slab discoloration may occur)

D. Products: Provide one of the following, or equal.
   1. “EUCOBAR” manufactured by The Euclid Chemical Co.
   2. “E-CON” manufactured by L&M Construction Chemicals, Inc.
   3. “Sealtight Evapre” manufactured by W.R. Meadows, Inc.

2.2 CURING COMPOUNDS

A. Description: Liquids containing film-forming polymers used to seal the surface of newly-finished concrete and prevent rapid moisture loss.

B. Application: When the permitted use of curing compounds is selected to cure flatwork, temporary (chemically dissipating) curing compounds are recommended and preferred.

C. Restrictions: Liquid membrane-forming curing compounds are not recommended where moisture-sensitive finish flooring is installed. Concrete curing compounds may not be used to cure flatwork indicated as receiving penetrants, overlays, or coverings without prior written acceptance from the manufacturer based on actual in-service conditions.
   1. If temporary curing compounds are used to cure flatwork, then mechanical abrasion, including planing and grinding, must be provided before beginning installation of any penetrant or overlay, including substrate preparation, to achieve complete removal of any film left behind that does not dissipate. If mechanical abrasion

methods do not adequately remove temporary curing compounds, then shot blasting, bead blasting, and abrasive blasting down to a level below curing compound penetration must be utilized before beginning application of any penetrant, overlay, or covering, including substrate preparation, to achieve complete curing compound removal.

2. If permanent curing compounds are used to cure flatwork, then shot blasting, bead blasting, and abrasive blasting down to a level below curing compound penetration must be utilized before beginning application of any penetrant, overlay, or covering, including substrate preparation, to achieve complete curing compound removal.

D. Temporary Curing Compounds (Chemically Dissipating Compounds):
   1. Description: Resin-based liquid membrane-forming curing compound conforming to ASTM C 309, Type 1-D (clear or translucent with fugitive dye that loses its coloring during proper usage), Class B (resin).
   2. Restrictions: Temporary curing compounds must be completely removed before beginning floor covering installation
   3. Products: "KUREZ DR-100" manufactured by The Euclid Chemical Co., or equal.

E. Permanent Curing Compounds (Non-Dissipating Compounds):
   1. Description: Water-based curing compound conforming to ASTM C 1315, Type 1 (clear or translucent), Class A (non-yellowing) and must be specially formulated and warrantied for proper concrete curing and chemical and adhesive compatibility with all covering adhesives and materials.
   2. Restrictions: Use only where floor coverings are indicated.
   3. Products: "FloorBond 710" manufactured by Floor Seal Technology, Inc., or equal.

F. Silicate-Based Curing Compounds: Curing compounds that contain silicate salts are prohibited. (these are chemically reactive in concrete, not film-forming)

G. Combination Curing Compounds: Combination curing compounds are prohibited, including cure & seal; cure & harden; cure, seal, & harden; and cure, seal, harden & dustproofing compounds.

H. Requisite Properties:
   1. Water Retention Rate: Maximum water loss may not exceed 0.40 kilograms per square meter in 72 hours, when tested in conformance with ASTM C 156.
   2. Maximum VOC Content: Not more than 60 grams per liter.

2.3 PREVENTATIVE (DAY-OF-POUR) MVECS

A. Description: Resin-based compound conforming to ASTM C 1315 and specially formulated for proper concrete curing; reducing moisture vapor emission levels to a specific and measurable rate; reducing shrinkage cracking; and chemical and adhesive compatibility with all floor covering adhesives and materials.

B. Application: With input from the preventative MVECS manufacturer, day-of-pour preventative MVECS may be considered for certain curing applications in lieu of curing compounds; and possibly in lieu of corrective (remedial) MVECS products specified in Section 09 05 16.

C. Restrictions: When substrates receiving day-of-pour preventative MVECS subsequently demonstrate during testing MVER and pH exceeding the limits required, recommended, or accepted by the penetrant, overlay, and covering manufacturers' published limits, preventative MVECS manufacturer must apply to those areas the corrective (remedial) MVECS products specified in Section 09 05 16 at no additional expense to the Contractor or Owner.

D. Products: "VaporSeal 309" manufactured by Floor Seal Technology, Inc., or equal.

E. Requisite Properties:
   1. Minimum Water Retention Rate: Maximum water loss of not more than 0.40 kilograms per square meter in 72 hours, when tested in conformance with ASTM C 156.
   2. Maximum VOC Material Content: Not more than 100 grams per liter.

2.4 FLOOR HARDENERS

A. Description: Water-based lithium silicate chemical hardening compound that chemically reacts to seal, harden, and densify flatwork surfaces.

B. Products: Provide one of the following, or equal.
   1. "Consolideck LS" manufactured by PROSOCO, Inc.
   2. "MirrorCrete" manufactured by Floor Seal Technologies.

2.5 ACCESSORIES

A. Screed Stakes: Prohibited; screeding systems must not puncture the below grade VDRs.

B. Wet Concrete RH Meter Accessories:
   1. Description: Disposable plastic tubes for measuring humidity in concrete.
   2. Manufacturer: Provide accessories manufactured by Vaisala Inc., or equal.
   3. Products: Provide all of the following parts for wet concrete installations.
      a. Plastic Tube Set: Vaisala Part No. 19266HM, or equal.
      b. Plastic Flange Set: Vaisala Part No. 26529HM, or equal.
      c. Long Rubber Plug Set: Vaisala Part No. 26530HM, or equal.

C. Saw Blades:
   1. Description: Diamond blades for early-entry dry-cut saws.
   2. Products: "Soff-Cut" manufactured by Husqvarna Construction Products, or equal.

PART 3 - EXECUTION

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Finish concrete to form smooth surfaces of uniform finish, color, appearance.
   3. Install evaporation reducers and curing and protection products using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques. Only apply such items under conditions that ensure finishes are free from blemishes and defects.
   4. Do not exceed the application rate recommended by the manufacturer.

B. Finishing:
   1. Comply with ACI 302.1R recommendations for screeding, floating, re-straightening, and finishing flatwork, including the proper use of a highway straightedge where applicable.
   2. Protect concrete from rapid moisture loss before and during finishing operations.
      a. Apply evaporation reducer as needed prior to beginning finishing operations, and periodically during finishing.
      b. Do not apply water to the slab surface during finishing operations.
   3. Finish flatwork to produce uniform surface appearance throughout the area involved and adjacent areas with the same finish.

C. Tolerances:
   1. Flatwork must conform to the tolerance classifications indicated below, when measured with an optical or laser level.
   2. When floor flatness is measured with a straightedge, flatwork must be measured in conformance with ASTM E 1486 between 16 and 72 hours after final troweling using a 10-foot straightedge placed anywhere on the slab in any direction and allowing it to rest on 2 high spots.
   3. When flatwork is not sloped and total project area is 10,000 square feet or greater, floor flatness and levelness must be measured in conformance with ASTM E 1155 between 16 and 72 hours after completion of final troweling.
      a. Specified flatness values apply to both slabs on grade and elevated slabs.
      b. Specified levelness values apply only to slabs-on-grade and to elevated slabs when the slab remains supported in its as-cast position and there is no camber present.
      c. Specified levelness values do not apply to inclined or cambered slabs.
   4. Bullfloat Tolerance:
      a. Description: True plane with not more than 5/16-inch in 10 feet variation.
      b. Flatness: SOV between F(f) 13 and F(f) 20, with MLV at least F(f) 13.
      c. Levelness: SOV at least F(l) 15 with MLV at least F(l) 10.
   5. Straightedge Tolerance (Conventional):
      a. Description: True plane with not more than 1/4-inch in 10 feet variation.

b. Flatness: SOV between F(f) 21 and F(f) 25, with MLV at least F(f) 17.
c. Levelness: SOV at least F(l) 17 with MLV at least F(l) 11.

6. Moderately Flat Tolerance (Good):
   a. Description True plane with not more than 3/16-inch in 10 feet variation.
   b. Flatness: SOV at least F(f) 38, with MLV at least F(f) 26.
   c. Levelness: SOV at least F(l) 25 with MLV at least F(l) 17.
7. Flat Tolerance:
   a. Description: True plane with not more than 1/8-inch in 10 feet variation.
   b. Flatness: SOV at least F(f) 50, with MLV at least F(f) 34.
   c. Levelness: SOV at least F(l) 30 with MLV at least F(l) 20.
8. Very Flat Tolerance Classification: Not used.
9. Superflat Tolerance Classification: Not used.
10. Ultraflat Tolerance Classification: Not used.

D. Curing:
   1. Protect newly-finished concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 requirements for cold-weather protection, and with ACI 301 requirements for hot-weather protection during curing.
   2. Comply with ACI 308.1 requirements for concrete curing, utilizing one or more of the methods indicated below that do not mottle, discolor, or stain the concrete.
   3. Begin curing concrete promptly after free water has disappeared from flatwork surfaces after finishing.
   4. Comply with ACI 308R requirements for preventing flatwork from becoming dry during curing.

E. Tests and Inspections: Specified in Section 03 30 00.

F. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged, and defective work.

G. Protection:
   1. Protect installed flatwork in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

3.2 TOLERANCES

A. General: Finish concrete in conformance with the specified quality tolerance standard requirements. Flatwork must conform to the tolerance classifications indicated below, when measured with 3D laser scanning or Allen Face F-Meter methods.

B. Conventional Floor Classifications:
   1. Float Tolerance: Not used.

2. Straightedge Tolerance:
    a. Application: Generally recommended as a substrate for self-leveling overlays, polymer overlays, concrete toppings and repairs, broadloom carpet, medium and thick bed tiles with all edges less than 15 inches, penetrating concrete sealer, floors used for utility spaces, and floors usually left exposed.
    b. Minimum Tolerance: True plane with not more than 1/4-inch gap under a 10-foot straightedge.
    c. Minimum Flatness: SOV at least F(f) 25, with MLV at least F(f) 17.
    d. Minimum Levelness: SOV at least F(l) 15 with MLV at least F(l) 10.

C. Traditionally Flat Floor Classifications:
1. Moderately Flat Tolerance:
    a. Application: Generally recommended as a substrate for resilient tile, resilient sheet flooring, tile carpeting, and exposed in service concrete indicated as received a penetrating concrete sealer.
    b. Minimum Tolerance: True plane with not more than 3/16-inch gap under a 10-foot straightedge.
    c. Minimum Flatness: SOV at least F(f) 35, with MLV at least F(f) 23.
    d. Minimum Levelness: SOV at least F(l) 20 with MLV at least F(l) 10.
2. Flat Tolerance:
    a. Application: Generally recommended as a substrate for epoxy terrazzo.
    b. Minimum Tolerance: True plane with not more than 1/8-inch in 10 feet variation.
    c. Minimum Flatness: SOV at least F(f) 52 with MLV at least F(l) 35.
    d. Minimum Levelness: SOV at least F(l) 20 with MLV at least F(l) 10.

D. Exceptionally Flat Tolerance Classifications: Not used.

3.3 CURING

A. General:
1. Protect newly-finished concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 requirements for cold-weather protection, and with ACI 305.1 requirements for hot-weather protection during curing.
2. Comply with ACI 308.1 requirements for concrete curing, utilizing one or more of the methods indicated below that do not mottle, discolor, or stain the concrete.
3. Begin curing concrete promptly after free water has disappeared from flatwork surfaces after finishing.
4. Comply with ACI 308.1 requirements for preventing flatwork from becoming dry during curing.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections: Specified in Section 03 30 00.

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.

END OF SECTION

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SECTION 03 54 16 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing cement underlayment for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing cement underlayment for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading cement underlayment installers.

B. Submittals: Submit product data and written descriptions of specified qualifications.

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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Examine project conditions and field-verify ambient and existing conditions affecting underlayment installation.
   3. 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.
   4. Protect work areas, surfaces, in-place construction, and installed and adjacent items against soiling and damage.
   5. Prepare surfaces 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.
   6. Install underlayment using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.

B. Special Techniques:
   1. Thickness: Install screeds as required, recommended, or accepted by manufacturer to meet the following.
      a. Set screeds with a laser level so the minimum underlayment thickness is at least 1/8 inch.
      b. Where underlayment covers only a small area, grind, chisel, and undercut floor and deck slabs as necessary to ensure a minimum underlayment thickness of at least 1/8 inch.
   2. Place underlayment in one continuous operation, without cold joints, to produce uniform, level surfaces.
      a. Screed underlayment to levels and tolerances required, recommended, or accepted by the finish flooring manufacturer.
      b. Feather edges to match adjacent floor elevations.
   3. Cure underlayment in conformance with the manufacturer's instructions. Protect underlayment to prevent contamination during application and curing processes.

C. Correction and Repair:

1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged, and defective work.
3. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a “hollow” sound when tapped.
4. Installed underlayment must be warrantable. Do not install, correct, or replace underlayment in a manner that is un-warrantable by the manufacturer or that results in any other specified or other warranty or guarantee becoming void.

D. Protection:
1. Protect installed underlayment in place from deterioration and damage until covering underlayment.
2. Do not store anything on or adjacent to or against installed underlayment unless it is or they are protected from damage, as accepted in writing by the manufacturer’s representative. Do not use installed underlayment surfaces as work surfaces.
3. Remove protection when it’s no longer needed and before covering underlayment.

END OF SECTION

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DIVISION 05

METALS

SECTION 05 05 14 – SHOP-APPLIED STEEL PRIMER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shop-applied steel primer.
   2. Repair materials.
   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 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing coatings for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing coatings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading coating installers.

B. Submittals: Submit product data, samples, and written descriptions of specified qualifications.

C. Manufacturer Warranty: Furnish to the Owner a written manufacturer warranty for products, components, and accessories against all patent and latent defects; against incipient and catastrophic failure; and against color fading, chalking, cracking, checking, peeling, and adhesive failure for 20 years.

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 SHOP APPLIED STEEL PRIMER

A. 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.

B. Zinc-Rich Primer:
   1. Description: Zinc-rich high-performance coating primer.
   2. Application: Applied exterior exposed-in-service steel surfaces.
   3. Product: "Tneme-Zinc Series 90-97" 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: Reddish-gray or other standard color.
      c. Zinc Dust Pigment: ASTM D 520 Type III composition classification (not more than 0.002 percent lead).
   5. Performance Requirements:
      a. Minimum Dry Film Adhesion: At least 800 pounds per square inch pull, when tested in conformance with ASTM D 4541.
      b. Minimum Humidity Resistance: No blistering, cracking, rusting, or delaminating of film after at least 1,000 hours exposure, when tested in conformance with ASTM D 4585.
      c. Minimum Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film, and not more than 1/32-inch rust creep at scribe after at least 10,000 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.

2.3 REPAIR MATERIALS

A. Acrylic Spot 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 00WH, "Tnemec White".
   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.

B. Zinc-Rich Spot Primer:
   1. Description: Zinc-rich aromatic urethane organic primer.
   2. Application: Field-applied to repair damaged shop-applied zinc-rich primer.
   3. Product: "Hydro-Zinc 94-H20" manufactured by the Tnemec Co., or equal.
   4. Requisite Properties:
      a. Minimum Thickness: Between 2.5 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: Greenish-gray or other standard color.
      c. Zinc Dust Pigment: ASTM D 520 Type III composition classification (not more than 0.002 percent lead).
   5. Performance Requirements:
      a. Minimum Dry Film Adhesion: At least 800 pounds per square inch pull, when tested in conformance with ASTM D 4541.
      b. Minimum Humidity Resistance: No blistering, cracking, rusting, or delaminating of film after at least 1,000 hours exposure, when tested in conformance with ASTM D 4585.

c. Minimum Salt Spray Resistance: No blistering, cracking, rusting, or delaminating of film, and not more than 1/32-inch rust creep at scribe after at least 10,000 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.

C. Other Spot Primers: Provide spot primer identical to shop-applied primer originally used to prime surfaces.

2.4 SURFACE PREPARATION

A. Concealed and Interior Exposures:
1. Application: Applied to steel items installed in SSPC Environmental Zones 0 and 1A (concealed and interior service conditions not subject to wetting).
2. Surface Preparation: Prepare surfaces in conformance with manufacturer-prepared published and supplemental instructions, and SSPC surface preparation standard SSPC-SP3, "*Power Tool Cleaning*".

B. Exterior Moderate Exposures and all AESS (regardless of location):
1. Application: Applied to steel items installed in SSPC Environmental Zones 1B and 2A (moderate exterior service conditions).
2. Surface Preparation: Prepare surfaces in conformance with manufacturer-prepared published and supplemental instructions, and SSPC surface preparation standard SSPC-SP6/NACE 3, "*Commercial Blast Cleaning*" to a minimum surface profile of at least 1.5 mils, when measured in conformance with ASTM D 4417 Method B (Surface Profile Depth Micrometer).

C. Exterior Severe Exposures and Immersion Service:
1. Application: Applied to steel items installed in SSPC Environmental Zone 2B (severe exterior service conditions), Zone 2C (freshwater immersion conditions), and Zone 2D (saltwater immersion conditions).
2. Surface Preparation: Prepare surfaces in conformance with manufacturer-prepared published and supplemental instructions, and SSPC surface preparation standard SSPC-SP10/NACE 2, "*Near-White Blast Cleaning*" to a minimum surface profile of at least 2.0 mils, when measured in conformance with ASTM D 4417 Method B (Surface Profile Depth Micrometer).

D. Unknown or Incompatible Primers:
1. Application: Use when unknown shop- or factory-applied primers are discovered; or when high-performance steel primers are chemically or adhesively incompatible with shop- or factory-applied primers.
2. Surface Preparation: Apply specified spot primer as a full prime coat on all surfaces as a tie-coat for subsequent intermediate and top coats.

2.5 ACCESSORIES

A. Flash Rust Inhibitor/Salt Remover:
   1. Description: Blast and wash down-water additive that prevents flash rusting of wet abrasive and water-blasted ferrous metal surfaces; and of dry-blasted surfaces in a pressurized wash down.
   2. Product: “HoldTight 102” manufactured by HoldTight Solutions Inc., or equal.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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. Install coatings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. Only install coatings under conditions that ensure finishes are free from blemishes and defects.
   5. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Coating 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. Completed work must match approved samples and mockups, as accepted by the Architect.
   8. Installed coatings must be warrantable. Do not install, correct, or replace coatings in a manner that results in any warranty or guarantee becoming void.

B. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled coatings that cannot be cleaned to the same condition as new.
   4. Installed coatings must be warrantable. Do not install, correct, or replace primer in a manner that is un-warrantable by the manufacturer or that results in any warranty or guarantee becoming void.

END OF SECTION

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SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Structural steel.

B. Architecturally exposed structural steel.

1.2 RELATED SECTIONS (IF SECTION IS NOT AVAILABLE, SEE CONSTRUCTION PLAN)

A. Section 01 45 23 Testing and Inspection.

B. Section 03 30 00 - Cast-In-Place Concrete.

C. Section 04 22 00 - Concrete Unit Masonry.

D. Section 05 30 00 - Metal Decking

E. Section 05 50 00 - Metal Fabrication

F. Section 07 81 00 - Cementitious Fireproofing

G. Section 09 90 00 - Paints and Coatings

1.3 REFERENCES

A. AISC MO15L – Manual of Steel Construction, Allowable Stress Design, 9th edition.

B. AISC S323 – Quality Criteria and Inspection Standards.

C. ASTM A36 – Structural Steel.

D. ASTM A53 – Hot Dipped, Zinc-Coated Welded and Seamless Steel Pipe.

E. ASTM A108 – Steel Bars, Carbon, Cold-Finished, Standard Quality.

F. ASTM A123 – Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

G. ASTM A153 – Zinc Coating (Hot Dip) on Iron and Steel Hardware.

H. ASTM A307 – Carbon Steel Externally Threaded Standard Fasteners.

I. ASTM A325 – High Strength Bolts for Structural Steel Joints.

J. ASTM A500 – Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

K. ASTM A653 – Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process.

L. ASTM C1107 – Packaged Dry, Hydraulic Cement Grout (Non-Shrink).

M. AWS A2.4 – Standard Welding Symbols.

N. AWS D1.1 – Structural Welding Code.

O. AWS WHB-1 – Qualification and Certification.

P. AWS A5.1 – Carbon Steel Covered Arc-Welding Electrodes.

Q. SSPC – Steel Structures Painting Council, SP-2, Hand Tool Cleaning.

R. CBC Chapter 22, Division III – Allowable Stress Design and Plastic Design for Structural Steel Buildings.

S. ASTM A572 – Grade 50 – Structural Steel.

T. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold-Finish, Standard Quality.

U. AISC – American Institute of Steel Construction, Code of Standard Practice for Steel Buildings and Bridges, for Architecturally Exposed Structural Steel.

V. ASTM A992 – Steel for Structural Shapes for Use in Building Framing.

W. ASTM F1554 – Standard Specification for Anchor Bolts.

X. ASTM A780 – Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

Y. Federal Emergency Management Agency (FEMA)

1. FEMA 353 – Recommended Specification and Quality Assurance Guidelines for Steel Moment Frame Construction for Seismic Application, latest edition.

2. American Institute of Steel Construction (AISC) Seismic Provisions for Structural Steel Buildings latest edition.

1.4 SYSTEM DESCRIPTION

A. Regulatory Requirements:

1. Structural steel shall conform to CBC requirements, except that steel manufactured by acid Bessemer process is not permitted for structural purposes.

1.5 SUBMITTALS

A. Shop Drawings:

1. Submit Shop Drawings, including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection. Fully detail minor connections and fastenings not shown or specified in the Contract Documents to meet required conditions using similar detailing as shown in the Contract Documents. Include a fully detailed, well controlled sequence and technique plan for shop and field welding that minimizes locked in stresses and distortion; submit sequence and technique plan for review by the Architect.

a. Include details of cuts, connections, camber, and holes in accordance with Figure 4.5 of AWS D1.1-02 or AISC Section J1.8, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.

b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed for Work specified in other section.

d. Submit a list of steel items to be galvanized.

B. Product Data:

1. Submit copies of fabricator's specifications and installation instructions for the following products. Include laboratory test reports and other data required demonstrating compliance with these Specifications:

a. Structural steel, each type; including certified copies of mill reports covering chemical and physical properties.

b. Welding electrodes.

c. Welding gas.

d. Unfinished bolts and nuts.

e. Structural steel primer paint.

f. High-strength bolts, including nuts and washers.

C. Manufacturer's Mill Certificate:

1. Submit, certifying that products meet or exceed specified requirements.

D. Mill Test Reports:

1. Submit manufacturer's certificates, indicating structural yield and tensile strength, destructive and non-destructive test analysis.

E. Charpy-V-Notch (CVN) Impact Test: Submit certified copies of Charpy-V-Notch (CVN) Impact Test by the manufacturer for applicable steel members and components.

F. Submit certified copies of tests by manufacturer for fine grain practice. Structural steel base material, as described above, shall be manufactured using fully killed fine grain practice having grain size number 5 or better as determined by ASTM E 112.

G. Weld Procedures: Submit weld procedures for all welding on project to Owner's testing laboratory for approval. After approval by testing laboratory, submit to Architect for record. Weld procedures shall be qualified as described in AWS D1.5, Section 5.12 or 5.13 for self-shielded FCAW, Weld procedures shall indicate joints details and tolerances, preheat and interpass temperature, post-heat treatment, single or multiple stringer passes, peening of stringer passes for groove welds except for the first and the last pass, electrode type and size, welding current, polarity and amperes and root treatment. The welding variables for each stringer pass shall be recorded and averaged, from these averages the weld heat input shall be calculated. Submit the manufacturer's product data sheet for all welding material used.

H. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1. 1-02. Shop welders shall be Project certified for FCAWS in accordance with AWS D1. 1-02.

I. Test Reports: Submit reports of tests conducted on shop and field welded and bolted connections. Include data on type of test conducted and test results.

J. Welding Material Certification: Comply with FEMA 353, Part I, Section 1.4.6.3. Submit to Owner's testing laboratory.

1.6 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges, latest edition.

2. Perform welding in accordance with AWS Standards, AWS D1.1, and California Building Code latest edition.

3. Welding for Moment Frames:

a. Heavy Sections: Comply with AISC Seismic Provision

b. Lamellar Tearing: Comply with AISC Seismic Provision

c. Column Webs at Continuity Plates: AISC Seismic Provision

d. Column Webs at Doubler Plates: AISC Seismic Provision

e. Web Access Hole: AISC Seismic Provision

B. Shop fabrication shall be inspected in accordance with CBC.

C. Erect mock-up panel of fabricated structural steel meeting Architecturally Exposed Structural Steel tolerances for exposed areas. Approval by Architect is required. Mock-up to remain for comparison but may not be left as part of the work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store structural steel above grade on platforms, skids or other supports.

B. Protect steel from corrosion.

C. Store welding electrodes in accordance with AWS D 12.1.

D. Store other materials in a weather-tight and dry place until installed into the Work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Stock Materials: Provide exact materials, sections, shapes, thickness, sizes, weights, and details of construction indicated on Drawings. Changes because of material stock or shop practices will be considered if net area of shape or section is not reduced thereby, if material and structural properties are at least equivalent, and if overall dimensions are not exceeded.

2.2 MATERIALS

A. Structural Steel: All wide flange shapes shall conform to ASTM A 992 grade 50. Other steel shall conform to ASTM A36.

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low carbon bolts and nuts.

C. High-Strength Threaded Fasteners: ASTM A 325, ASTM A490 or ASTM F1852 quenched and tempered, steel bolts, nuts and washers.

D. Primer: Lead-free metal primer.

E. Steel Pipe: ASTM A 53.

F. Structural Tubing:

1. Hot-formed, ASTM A 501.

2. Cold-formed, ASTM A 500, Grade B.

G. Galvanizing: ASTM A 123.

H. Welding Electrodes: Provide electrodes recommended by manufacturer for seismic connections.

1. Comply with AISC Seismic Provision

I. Shear stud connectors: ASTM A108, Grade 1015 forged steel, headed, uncoated, granular flux filled shear connector or anchor studs by Nelson Stud Welding Division of TRW, Lorain, OH, or equal.

J. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of **7,000** psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.3 FABRICATION

A. Cleaning and Straightening Materials: Materials being fabricated shall be thoroughly cleaned of scale and rust, and straightened before fabrication. Cleaning and straightening methods shall not damage material. After punching or fabrication of component parts of a member, twists or bends shall be removed before parts are assembled.

B. Cutting, Punching, Drilling and Tapping: Unless otherwise indicated or specified, structural steel fabricator shall perform the cutting, punching, drilling and tapping of Work so that Work of other trades will properly connect to steel Work.

C. Milling: Compression joints depending on contact bearing shall be furnished with bearing surfaces prepared to a common plane by milling.

D. Use of Burning Torch: Oxygen cutting of members shall be performed by machine. Gouges greater than 3/16 inch that remain from cutting shall be removed by grinding. Reentrant corners shall be shaped notch free to a radius of at least 1/2 inch. Gas cutting of holes for bolts or rivets is not permitted.

E. Galvanizing: After fabrication, items indicated or specified to be galvanized shall be galvanized in largest practical sizes. Fabrication includes operations of shearing, punching, bending, forming, assembling or welding. Galvanized items shall be free from projections, barbs, or icicles resulting from the galvanizing process.

F. Welding:

1. Type of steel furnished in welded structures shall provide chemical properties suitable for welding as determined by chemical analysis. Welds shall conform to the requirements of CBC Chapter 17. Conform to AWS D1.1, and CBC Chapter 22.

2. Materials and workmanship shall conform to the requirements specified herein and to CBC requirements, modified as follows:

a. No welded splices shall be permitted except those indicated on Drawings unless specifically reviewed by the Architect.

b. Drawings will designate joints in which it is important that welding sequence and technique be controlled to minimize shrinkage stresses and distortion.

3. Welding shall be performed in accordance with requirements of the AWS Structural Welding Code.

a. Welded Joint Details: comply with AISC Seismic Provision

4. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for Architecturally Exposed Structural Steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

5. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Shop Finish:

1. Notify the IOR when Work is ready to receive shop prime coat. Work shall be inspected by the IOR before installation of primer.

2. Structural steel and fittings, except galvanized items, which will be exposed when building is completed, shall receive a coat of primer.

3. The primer specified shall be spray applied, filling joints and corners and covering surfaces with a smooth unbroken film. The minimum dry film thickness of the primer shall be 2.0 mils.

4. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete or high strength bolted.

H. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

I Fabricate Architecturally Exposed Structural Steel with exposed surfaces smooth, square, and free of surfaces blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.

2. Comply with fabrication requirements, including tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.

J. Architecturally Exposed Structural Steel: use special care in unloading, handling and erecting the steel to avoid marking or distorting the steel members. Minimize damage to any shop paint when temporary braces or erection clips are used. Avoid unsightly surfaces upon removal. Grind smooth tack welds and holes filled with weld metal or body solder. Plan and execute all operations in such a manner that the close fit and neat appearance of the structure will not be impaired.

K. Reduced Beam Sections (RBS's): Fabrication of RBS's as defined in AISC Seismic Provision

2.4 SHOP AND FIELD QUALITY CONTROL

A. The independent testing laboratory shall conduct and interpret test and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

B. Provide access to all places where structural steel Work is being fabricated or produced so required inspection and testing can be performed.

C. The independent testing laboratory may inspect and/or test structural steel at plant before shipment; however, Architect reserves the right at any time before Final Completion to deem materials not in compliance with the specified requirements as defective Work.

D. Correct defects in structural Work when inspections and laboratory test reports indicate noncompliance with specified requirements. Perform additional tests as may be required to reconfirm noncompliance of original Work, and as may be required to show demonstrate compliance of corrected Work.

E. Welding: Inspect and test during fabrication and erection of structural steel assemblies as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the Work. Record Work required and performed to correct deficiencies.

2. Inspect welds. Welds shall be visually inspected before performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. Testing shall be performed to AWS D1.1 Table 6.3 cyclically loaded non-tubular connections.

3. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Repair and test defective welds.

4. Rate of Testing: Completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.

5. Welds, when installed in column splices, shall be tested by either ultrasonic testing or radiography.

6. Base metal thicker than 1-1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected by shear wave methods for discontinuities directly behind such welds. Tests shall be performed at least 48 hours after completed joint has cooled down to ambient air temperature.

7. Any material discontinuities shall be reviewed based on the defect rating in accordance with the criteria of AWS D1.1 table 6.3 by the Architect.

8. Other method of non-destructive testing and inspection, for example, liquid dye penetrate testing, magnetic particle inspection or radiographic inspection may be performed on weld if required.

9. Lamellar Tearing: Lamellar-tearing resulting from welding is a crack (with zero tolerance) and shall be repaired in accordance with AWS D1.1.

10. Lamination: The rejection criteria shall be based on ASTM A 435.

11. Where testing reveals lamination or conditions of lamellar tearing in base metal, the steel fabricator shall submit a proposed method of repair for review by the Architect. Test repaired areas as required.

12. Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1 – Qualification.

H. Lamellar Tearing: Prior to welding plates 1 to 1-1/2 inches thick and greater and rolled shapes within the distance from 6 inches above the top of the joint to 6 inches below the bottom of the joint shall be checked by ultrasonic testing for laminations in base metal which may interfere with the inspection of the completed joint. Should these defects occur, members will be reviewed by the Architect. Welding procedure specifications in sub-section 1.5G specify welding practices to minimize lamellar tearing.

I. Prior Testing of Base Material: Test material before fabrication.

J. Lines and levels of erected steel shall be certified by a State of California licensed surveyor as set forth in related Division 01 section.

K. Welded studs shall be tested and inspected by the special inspector in accordance with requirements of AWS D1.1 – Stud Welding.

L. Record Drawings: After steel has been erected, correct or revise Shop Drawings and erection diagrams to correspond with reviewed changes performed in the field.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify governing dimensions and conditions of the Work before commencing erection Work.

1. Report discrepancies between drawings and field dimensions to Architect before commencing work.

2. Beginning of installation means erector accepts existing conditions and surfaces underlying or adjacent to work of this section.

B. Provide temporary shoring and bracing, and other support during performance of the Work. Remove after steel is in place and connected, and after cast-in-place concrete has reached its design strength.

3.2 ERECTION

A. Install structural steel accurately in locations, to elevations indicated, and according to AISC specifications and CBC requirements.

B. Clean surfaces of base plates and bearing plates.

1. Install base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate before packing with grout.

C. Maintain erection tolerances of structural steel within AISC Code of Standard Practice for Steel Buildings and Bridges.

1. Members and components, plumbed, leveled and aligned to a tolerance not to exceed one-half the amount permitted for structural steel. Contractor to provide adjustable connections between Architecturally Exposed Structural Steel and the structural steel frame or the masonry or concrete supports, in order to provide the erector with means for adjustment.

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact after assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Do not permit thermal cutting during erection of structural steel.

F. Where indicated for field connections, provide standard bolts complying with ASTM A 307.

G. Install high strength steel bolts at locations indicated. Assembly and installation shall be in accordance with CBC requirements.

1. Allowable hole sizes: 1/16 inch larger than bolt size.

2. Use friction type connection with standard hardened steel circular, square or rectangular washer under bolt nut.

3. Thoroughly clean area under bolt head, nut and washer. Remove all paint, lacquer, oil or other coatings except organic zinc-rich paints in accordance with SSPC, SP-2.

4. Tighten bolts by power torque wrench or hand wrench until twist-off.

H. Contractor shall be responsible for correcting detailing and fabrication errors and for correct fitting of all members and components.

I. Erect structural steel plumb and level and to proper tolerances as set forth in the AISC Manual. Provide temporary bracing, supports or connections required for complete safety of structure until final permanent connections are installed.

J. Install column bases within a tolerance of 1/8 inch of detailed centerlines, level at proper elevations. Support bases on double nuts and solidly fill spaces under bases with dry-pack cement grout.

K. Provide anchor bolts with templates and diagrams. Contractor shall be responsible for proper location and installation of bolts. Correct deficiencies and errors.

L. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

3.3 FITTING

A. Closely fit members, finished true to line and in precise position required to allow accurate erection and proper joining in the field.

B. Drilling to enlarge unfair holes will not be allowed. Allow only enough drifting during assembly to bring parts into position, but not sufficient enough to enlarge holes or distort the metal. Do not heat rolled sections, unless approved by Architect.

3.4 PUNCHING AND DRILLING

A. Punch material 1/16 inch larger than nominal diameter of bolt, wherever thickness of metal is equal to or less than the diameter of the bolt plus 1/8 inch.

B. Drill or sub-punch and ream where metal is equal to or more than the diameter of the bolt plus 1/8 inch. Make diameter for sub-punched and sub-drilled holes 1/16 inch larger than nominal diameter of bolt.

C. Precisely locate holes to ensure passage of bolt through assembled materials without drifting. Enlarge holes when necessary to receive bolts by reaming; flame cutting to enlarge holes is not acceptable. Structural Steel members with poorly matched holes will be rejected.

3.5 FINISHING

A. After erection, spots or surfaces where paint has been removed, damaged, or burned off and field rivets, bolts, and other field connections not concealed in the work, shall be cleaned of dirt, oil, grease, and burned paint and furnished with a spot coat of the same primer installed during shop priming.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Install paint to exposed areas with the same material installed during shop painting. Install by brush or spray to provide a minimum dry film thickness of 1.5 mils.

3.6 FIELD QUALITY CONTROL

A. Owner will provide a special inspector and independent testing laboratory to perform field inspections and tests and to prepare test reports.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

3.7 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project Site.

3.8 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.9 HANDLING

A. Both in shop and in the field, transport, handle and erect to prevent damage or overstressing of any component.

END OF SECTION

SECTION 05 40 00 – 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.

1.2 SECTION 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 00.

C. Qualifications:
1. Installer: Company or individuals must have at least 5 years' experience installing framing for at least 30 previous 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 at least 7 years' experience installing framing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading framing installers.
4. Engineer: Must be a licensed professional structural engineer registered to practice in California having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

D. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and delegated design submittals.

E. 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.

F. 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*".

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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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. Securely attach framing in place to supporting construction.
   3. Install framing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. Set framing true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
   5. Securely attach framing in place to supporting construction.

B. 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged, and defective work.

3. Installed framing must be warrantable. Do not install, correct, or replace framing in a manner that is un-warrantable by the manufacturer or that results in any warranty or guarantee becoming void.

D. Protection:
   1. Protect installed framing in place from deterioration and damage until covering framing.
   2. Remove protection when it's no longer needed and before covering framing.

END OF SECTION

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SECTION 05 41 00 – STRUCTURAL METAL STUD FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing metal stud systems.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4523 - Testing and Inspection.
3. Section 05 1200 - Structural Steel Framing.
4. Section 09 2216 - Non-Structural Metal Framing.

1.2 SUBMITTALS

A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies, size and spacing of framing components.

B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.3 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. AISI - Specifications for Design of Cold Formed Steel Structural Members.
2. Welds shall be performed by AWS certified welders. Welding shall be performed in accordance with requirements of American Welding Society (AWS) Structural Welding Code-Steel D1.1 and D1.3. Structural welding Code-Sheet Steel.
3. Welding shall be inspected by a special inspector, approved by DSA to inspect Work of this section. The Project Inspector shall be responsible for monitoring work of special inspector to ensure that inspection program is satisfactorily completed.
4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot Dip Process.
5. ASTM A924 – Standard Specification for General Requirements for Steel Sheet Metallic-Coated by Hot-Dip Process.

6. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

7. ASTM A1008 – Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability.

8. ASTM C954 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks) and Bracing or Bridging for Screw Application of Gypsum Panel Products and Plaster Bases.

9. ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

10. ASTM C1007 – Standard Specification for Installation of Structural (Axial and Transverse) Steel Framing Members and Accessories.

11. ASTM E488 – Standard Test Methods of Strength Anchors in Concrete and Masonry.

12. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

13. Manufacturer shall be a member of the Steel Stud Manufacturers Association (SSMA).

B. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straight edge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

1.4 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.

B. Store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide studs, tracks, joists, header, and accessories manufactured by one of following:

1. ClarkWestern Building Systems.

2. Dietrich Industries, Inc.

3. Marino/WARE.

4 Cemco.

5. Equal.

B. Special Connection Accessories: Products manufactured by The Steel Network, Inc., or equal.

2.2 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 50 ksi minimum.

2. Metal framing shall be zinc coated in conformance to requirements of ASTM A926, G60.

3. Metal framing shall be manufactured in conformance to ASTM C955.

4. Install metal framing per ASTM C1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. Gages and properties of studs shall be as indicated on Drawings.

C. Mechanical anchors to concrete and masonry shall be metal cinch at least 3/8 inch in diameter threaded bolt head type. Anchor bolts to be installed in concrete shall be hook type ½ inch diameter or more. Unless otherwise indicated.

D. Mechanical anchors to metal framing shall be No. 10 self-tapping and self-drilling wafer-head screws.

E. Accessories: Special top tracks, angles, fasteners, and strips of gypsum wallboard, as required for fire rating assembly required at each condition.

F. Mineral Wool Safing Insulation: 4.0 pcf density. Thermafiber, Fibrex, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumb and true. Install necessary accessories for proper installation.

B. Anchor top and bottom runner track to ceiling or roof structure overhead and to floor structure below.

C. Install studs squarely in top and bottom runner track with firm abutment against track webs.

D. Align and plumb studs, and fasten to flanges of both top and bottom runner tracks.

E. Provide three studs minimum at corners of stud walls. Locate so as to provide surfaces for attachment of interior and exterior facing materials.

F. Members not indicated to be welded together shall be attached with manufacturer recommended screws with minimum one screw at each flange of stud to top and bottom track. Wire tying of framing members is not permitted.

G. Provide lateral bracing and bridging in accordance with manufacturer's written recommendations or as required by CBC.

H. Intersecting walls and partitions, whether load-bearing or not, shall be connected.

I. Splices in axially loaded studs are not permitted.

J. Splice or butt weld butt joints in runner tracks. No splices are permitted in tracks over lintels, diaphragm sheathing, or diagonal bracing.

K. Weld connections by fillet welds or plug welds in accordance with AWS recommended procedures and practices.

L. Touch-up field abrasions and welds with galvanizing touch-up material.

M. Studs that frame door openings shall be clipped to floor with 14 gage angle clips. Each clip to have two fasteners into studs and two fasteners into floor.

N. Provide additional joists or blocking adjacent to exterior and interior walls, openings and elsewhere as required to provide support for indicated ceiling construction.

O. Provide an additional joist under parallel partitions where partition length exceeds ½ joist span and around floor and roof openings which interrupt one or more spanning members.

3.2 CONNECTIONS TO METAL DECKING

A. Provide premolded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. Top runner track of fire-rated partitions shall be a minimum of 36 mils (20 gage), unless noted otherwise, and attached to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Areas above runner shall be friction fit with a minimum depth of 2 ½ inches of 4 pounds per cubic foot density mineral wool insulation. A minimum of ½ inch of firestopping compound shall be installed to each side of mineral wool insulation for a one-hour system, and one inch of firestopping for a two-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard to provide required fire resistance rating.

C. Fire-rated top tracks shall be installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.3 QUALITY CONTROL

A. Welding Inspection:

1. Inspection of field welding operations shall be performed by special inspector.

2. The special inspector shall inspect material, equipment, procedures, welds, and welder qualifications.

3.4 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.5 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following metal fabrications:

1. Rough hardware
2. Ladders
3. Ladder safety cages
4. Miscellaneous framing, supports and trim
5. Metal bar gratings
6. Steel pipe guardrails and handrails
7. Metal stairs

B. Related Sections: Refer to Section 05 12 00, "Structural Steel" for structural steel framing components as applicable.

1.2 REFERENCES

A. Aluminum Association (AA)

B. American National Standards Institute (ANSI)

C. American Society of Testing and Materials (ASTM)

D. American Welding Society (AWS)

1. D1.1 - Structural Welding Code - Steel
2. D1.3 - Structural Welding Code - Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

1. AMP 500 Metal Finishes Manual
2. AMP 510 Metal Stair Manual
3. MBG 531 Metal Bar Grating Manual
4. MBG 532 Heavy Duty Metal Bar Grating Manual and Pipe Railing Manual

F. Steel Structures Painting Council (SSPC)

1.3 DEFINITIONS

A. Refer to ASTM E985 for railing-related terms that apply to this section.

B. Refer to the NAAMM publications listed in Article 1.02 "References" for definition of terms that apply to this section.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Section 01 33 00, "Submittal Procedures".

B. Product Data: Submit product data for products used in metal fabrications, including paint products, grout and fasteners.04-29-11 Issuance UTD - Section 05 50 00 Page 2 of 12 Metal Fabrications

C. Shop Drawings: Submit detailed shop and erection drawings of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

D. Welder certificates signed by the Contractor certify that welders comply with requirements specified in 1.05C.

E. Welding Procedures: Provide written welding procedure specification (WPS) document per AWS Code requirements.

F. Qualification data for firm specified in 1.05B to demonstrate their capabilities and experience.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated. Where conflicts occur, comply with the more stringent requirements.

1. ANSI 14.3

2. AWS D1.1 and D1.3

3. NFPA 101

B. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that shown on the drawings, with sufficient production capacity to produce required units without causing delay in the work.

C. Qualify welding processes and welding operators in accordance with AWS D1.1 and D1.3.
Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. All materials used shall be free of lead and asbestos fibers.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: Form metal fabrications exposed to view upon completion of the work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A36.

C. Rolled Steel Floor Plates: ASTM A786.

D. Steel Bars for Gratings: ASTM A569 or ASTM A36.

E. Wire Rod for Grating Cross Bars: ASTM A510.

F. Steel Tubing: Cold-formed, ASTM A500, Grade B, unless otherwise indicated.

G. Uncoated Structural Steel Sheet: Hot-rolled, ASTM A570, Grade 30 unless otherwise indicated.

H. Uncoated Steel Sheet (Commercial quality): Cold-rolled, ASTM A366.

I. Galvanized Steel Sheet: Quality as follows:

1. Structural Quality: ASTM A446; Grade A, unless another grade required for design loading, and G90 coating designation unless otherwise indicated.

2. Commercial Quality: ASTM A526, G90 coating designation unless otherwise indicated.

J. Steel Pipe: ASTM A53, Type S, Grade B, standard weight (schedule 40), black finish, unless otherwise indicated.

K. Gray Iron Castings: ASTM A48, Class 30.

L. Malleable Iron Castings: ASTM A47, Grade 32510.

M. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

N. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47,or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTMA153.

O. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.2 STAINLESS STEEL

A. Bar Stock: ASTM A276, Type 302 or 304.

B. Plate: ASTM A167, Type 302 or 304.

2.3 ALUMINUM

A. Extruded Bars and Shapes: ASTM B221, alloy 6061-T6 or 6063-T6 for bearing bars of gratings and shapes and 6061-T6 for grating cross bars.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B632, alloy 6061-T4 for treads and 6061-T6 for platforms.

2.4 GROUT

A. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

1. Euco N-S Grout - Euclid Chemical Co

2. Kemset - Chem-Masters Corp

3. Crystex - L & M Construction Chemicals, Inc

4. Sonogrout - Sonneborn Building Products Div., Rexnord Chemical Products, Inc

2.5 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required. Suspect/counterfeit bolts will not be accepted and will be replaced at Contractor's expense.

2.6 PAINT

A. Shop Primer for Ferrous Metal: Red oxide, lead- and cadmium-free, corrosion- inhibiting primer complying with performance requirements of FS TT-P-664.

B. Galvanizing Repair Paint: High zinc dust content paint for galvanizing welds in galvanized steel, with dry film containing not less than 94% zinc dust by weight, and complying with SSPC- Paint-

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint-12 except containing no asbestos fibers.

D. Zinc Chromate Primer: FS TT-P-645.

2.7 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements for Section 03 30 00, "Cast-in- Place Concrete" for normal weight, ready-mix concrete with minimum 28- day compressive strength of 3000 psi (21 MPa), unless higher strength indicated.

B. Nonslip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non- glazing; unaffected by freezing, moisture, or cleaning materials.

2.8 FABRICATION - GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature change (Range): 100 ° F (38 ° C).

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32” (0.794 mm), unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with AWS recommendations and 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. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matched those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.9 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required. Fabricate items to sizes, shapes, and dimensions required.

2.10 STEEL LADDERS

A. General: Exterior fixed ladders shall meet OSHA requirements found in 29CFR1910.27, with the exception that #6 rebar is not to be used. Fabricate ladders for the locations shown, with dimensions, spacing's, details and anchorages as indicated. Comply with requirements of ANSI A14.3 where conflicts occur, comply with the more stringent requirements.

B. Side Rails: Continuous steel flat bars, minimum size (cross section) 2½" x ⅜" (63.5 mm x 9.5 mm), with eased edges, spaced 18" (0.46 m) apart.

C. Bar Rungs: Round steel bars, minimum ¾" (19.1 mm) diameter spaced no greater than 12" (305 mm) o.c. and uniform throughout the length of the ladder. Individual metal rungs embedded in concrete which serve as access to pits and other areas under floors, should have a minimum diameter of 1" (25 mm) or shall otherwise be treated to resist corrosion and rusting.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" (1.5 m) o.c. by means of welded brackets, unless otherwise indicated.

1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7" (178 mm).

2. Extend side rails 42" (1.1 m) above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.

2.11 LADDER SAFETY CAGES

A. General: Fabricate ladder safety cages to comply with requirements of ANSI A14.3; where conflicts occur, comply with the more stringent requirements. Assemble safety cages by welding.

B. Primary Hoops: Steel bars, 3" x ¼" (76 mm x 6.4 mm), for top, bottom, and for cages longer than 20' (6.1m), intermediate hoops spaced not more than 20'-0" (6.1 m) o.c.

C. Secondary Intermediate Hoops: Steel bars, 2" x ¼" (51 mm x 6.4 mm) hoops spaced not more than 4'-0" (1.2 m) o.c. between primary hoops.

D. Vertical Bars: Steel bars, 1½" x ¼" (38.1 mm x 6.4 m), secured to each hoop, spaced at intervals not more than 40° (0.7 rad) o.c. around the circumference of the cage, maximum spacing of approximately 9½" (241mm) o.c.

E. Fasten assembled safety cage to ladder rails and adjacent construction as indicated.

2.12 MISCELLANEOUS METAL ITEMS

A. Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated, which are not parts of structural steel framework, as required to complete work.

1. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints

for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24” (61 cm) o.c. and provide minimum anchor units in the form of steel straps 1¼" wide x ¼" x 8" long (31.8 mm x 6.4 mm x 203 mm).

B. Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.13 METAL BAR GRATINGS

A. General: Produce metal bar gratings of description indicated per NAAMM marking system that complies with the following:

1. Metal Bar Grating Standard: "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" published in ANSI/NAAMM MBG 531.

2. Heavy Duty Metal Bar Grating Standard: "Guide Specifications for Heavy Duty Metal Bar Grating" published in ANSI/NAAMM MBG 532.

B. If gratings are located in walking surfaces, gratings shall have spaces no greater than ½” (12.7 mm) wide in one direction. If gratings have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

C. Fabricate steel gratings to comply with requirements as indicated on the drawings.

D. Traffic Surface for Steel and Aluminum Bar Gratings: Plain, unless otherwise indicated.

E. Steel Finish: Shop prime paint applied in accordance with manufacturer's standard practice.

F. Aluminum Finish: Mill (as fabricated), unless otherwise indicated.

G. Fabricate removable grating sections with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated, or if not indicated, as recommended by manufacturer, for attachment to supports.

1. Heavy Duty Grating: Provide not less than 4 anchor blocks, ¼” (6.4 mm) minimum thickness, for each section of grating composed of bearing bars over 3/16” (4.8 mm) in thickness, with each block shop welded to 2 bearing bars.

2. Non-heavy Duty Grating: Provide not less than 4 saddle clips for each grating section composed of rectangular bearing bars 3/16" (4.8 mm) or less in thickness and spaced not less than 15/16" (23.8 mm) o.c., with each clip designed and fabricated to fit over 2 bearing bars. Furnish threaded bolts with nuts and washers for each clip required, unless otherwise indicated.

H. Attach toe plates to grating by welding, unless otherwise indicated. Toe plate height: 4" (102 mm), unless a greater height indicated. Fabrications

I. Fabricate cutouts in grating sections for penetrations indicated. Arrange layout of cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge band openings in grating that interrupt 4 or more bearing bars with bars of same size and material as bearing bars.

2. Do not notch bearing bars at supports to maintain elevation.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal bar gratings that may be incorporated in the work include, but are not limited to, the following:

1. Alabama Metal Industries Corp

2. Barnet/Bates Corp

3. Big D Metals

4. McNichols

2.14 STEEL PIPE GUARDRAILS AND HANDRAILS

A. General: Fabricate pipe guardrails and handrails to comply with requirements indicated for dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacing's, and anchorage.

B. Interconnect guardrails and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, weld all around and grind smooth.

C. Form changes in directions of railing members as follows:

1. By use of welded prefabricated steel elbow fittings

2. By bending, of radius indicated

3. By mitering at elbow bends

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross- section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

F. Close exposed ends of pipe by welding 3/16" (4.8 mm) thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is ¼" (6.4 mm) or less.

G. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use 4 inches high x ¼" (102 mm x 6.4 mm) steel bar welded to each railing post.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of guardrails and handrails to other work. Furnish inserts and other anchorage devices for connecting guardrails and handrails to concrete or masonry work.

1. For railing posts set in concrete, fabricate sleeves from steel pipe not less than 6" (152 mm) long and with an inside diameter not less than ½" (12.7 mm) greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

2. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12" of post height. Provide socket covers designed and fabricated to resist accidental dislodgement.

I. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fills to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.15 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated with welded connections, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

1. Fabricate treads and platforms of exterior stairs to accommodate slopes to drain in finished traffic surfaces.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers, newels, and framing members to stringers and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

C. Metal Pan Risers, Sub-treads, and Sub-platforms: Shape metal pans for risers and sub-treads to conform to configuration shown. Provide thickness of structural steel sheet for metal pans as indicated.

1. Form metal pans of uncoated cold-rolled steel sheet, unless otherwise indicated.

2. Form metal pans of galvanized steel sheet, where indicated on the drawings.

3. Attach Risers and Sub-treads to Stringers by the following methods:

a). Directly weld risers and sub-treads to stringers; locate welds on side of metal pans to be concealed by concrete fill.

b). Attach by means of brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding or bolting.

4. Provide sub-platforms of configuration and construction shown, with thickness of structural steel sheet as indicated. Attach sub-platform to platform framing members with welds or as otherwise indicated. Construct sub-platforms with smooth soffits.

D. Steel Floor Plate Treads and Platforms: Provide raised pattern steel floor plate in pattern indicated or, if not indicated, as selected from manufacturer's standard patterns.

1. Form treads of ¼" (6.4 mm) thick raised pattern steel floor plate with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and treads to brackets.

2. Fabricate platforms of raised pattern steel floor plate of thickness indicated. Provide nosing matching that on treads at all landings. Secure to platform framing members with welds.

E. Floor Grating Treads and Platforms: Provide patterns, spacing, and bar sizes indicated; fabricate to comply with NAAMM MBG 531.

1. Finish being shop prime paint, unless otherwise indicated.

2. Fabricate grating treads with steel plate nosing on one edge and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts or as otherwise indicated.

3. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe plates at open-sided edges of grating platform. Secure grating to platform frame with welds or as otherwise indicated.

F. Stair Guardrails and Handrails: Comply with applicable requirements specified elsewhere in this section for steel pipe guardrails and handrails, and as follows:

1. Fabricate newels of steel tubing and provide newel caps of gray-iron castings, as shown.

2. Railings may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.

3. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.16 PIPE BOLLARDS

A. Fabricate pipe bollards from 4" (102 mm) standard black steel pipe, Schedule 40, unless otherwise indicated. Cap bollards with ¼" (6.4 mm) minimum thickness steel base plate, or as otherwise indicated.

2.17 FINISHES

A. General: Comply with NAAMM AMP 500 "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

2.18 STEEL AND IRON FINISHES

A. General: Shop-paint uncoated surfaces of metal fabrications, except those to be embedded in concrete or masonry or to receive sprayed-on fireproofing, surfaces and edges to be welded, and galvanized surfaces, unless otherwise indicated. Comply with requirements of SSPC-PA 1 for shop painting.

B. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot- dip process in compliance with the following requirements:

1. ASTM A123 for galvanizing both fabricated and non-fabricated iron and steel products made of uncoated rolled, pressed, and forced shapes, plates, bars, and strip 0.0299" (0.7595 mm) thick and heavier.

2. ASTM A153 for galvanizing iron and steel hardware.

C. Surface Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below.

1. Remove oil, grease and similar contaminants in accordance with SP-1, "Solvent Cleaning".

2. Remove loose rust, scale, spatter, slag and other deleterious materials in accordance with SSPC.

D. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 3.0 mils (0.076 mm). Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection.

2.20 ALUMINUM FINISH

A. Mill (as fabricated) finish, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine the areas and conditions under which metal fabrication items are to be installed. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and Architect.

3.2 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Center nosing’s on tread widths with noses flush with riser faces and tread surfaces.

C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.3 INSTALLATION - GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include

threaded fasteners for concrete and masonry inserts, toggle bolts, and through-bolts, lag bolts, wood screws and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal- arch welding, appearance and quality of welds made, methods used in correcting welding work, and 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. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

F. Grout: Follow manufacturer's recommendations for substrate preparation and application.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.4 INSTALLATION OF METAL BAR GRATINGS

A. General: Install gratings to comply with requirements of NAAMM grating standard that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Secure removable units to supporting members with type and size of clips and fasteners indicated, or if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Secure non-removable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

D. Attach toe plates to gratings by welding, at locations indicated.

3.5 INSTALLATION OF STEEL PIPE GUARDRAILS AND HANDRAILS

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's directions.

2. Anchor posts and rail ends to steel with welded connections, unless otherwise indicated.

3. Anchor posts and rail ends into concrete and masonry with steel round flanges welded to post and rail ends, and anchored into wall construction with expansion shields and bolts.

4. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete.

Accurately locate sockets to match post spacing.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1½" (38.1 mm) clearance from inside face of handrail and finished wall surface. Locate brackets at spacing not less than 5'-0" (1.5 m) o.c., unless otherwise indicated. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.

3. For hollow masonry anchorage, fasten brackets directly on masonry wall using toggle bolts.

4. For steel framed gypsum board assemblies, fasten brackets to wood blocking using lag bolts or to metal blocking using self-tapping screws, of size and type required to support structural loads.

C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40' (12.2 m). Provide slip joint with internal sleeve extending 2" (51 mm) beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" (152mm) of posts.

3.6 INSTALLATION OF PIPE BOLLARDS

A. General: Install bollards at locations shown on drawings. After installation, fill pipe with concrete and provide a smooth convex curve at the top of the pipe.

B. Backfill: The backfill in the annular space around bollards not embedded in poured footings shall be by the following methods:

1. Clean excess soil from hole. Do not leave loose soil at bottom of hole.

2. Backfill shall be of concrete with an ultimate strength of 3,000 pounds per square inch (210.92 kgs/sq.cm) at 28 days. The hole shall not be less than 4" (101.6 mm) larger than the diagonal dimension of a round, square or rectangular bollard.

3.7 ADJUSTING AND CLEANING

A. Touch-Up Painting of Steel Items: Immediately after erection, clean field welds, bolted connections, abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch- up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 3.0 mils (0.076 mm).

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF 05 50 00

SECTION 05 55 16 – STAIR NOSINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Extruded aluminum stair nosings
   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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings, and samples.

PART 2 - PRODUCTS

2.1 EXTRUDED ALUMINUM STAIR NOSINGS

A. Description: Single-component abrasive stair nosing assemblies consisting of an extruded aluminum base container with integral anchoring lugs or studs, and an abrasive filler.

B. Application: Used at cast-in-place concrete stairs.

C. Ribbed Abrasive Products: “Type R-315P” manufactured by Balco USA, or equal.

D. Requisite Properties:
   1. Width: 3 inches wide.
   2. Nominal Length: Match stair tread width, less 1/8-inch clearance.
   3. Minimum Lip: At least 3/8-inch.
   4. Minimum Thickness: At least 1/4-inch thick.
   5. Color: Indicated on the Drawings or selected by the Architect.

E. Materials:
   1. Aluminum Base Container: ASTM B 221 Alloy 6061-T5 or Alloy 6063-T5; provide manufacturer’s standard mill finish with clear acrylic lacquer coated for components embedded in concrete.
   2. Abrasive Filler: Aluminum oxide and silicon carbide granules mixed into an integral-color 2-part epoxy matrix. Abrasives with cementitious-based resins are prohibited.

2.2 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 nosings and adjacent items.
   3. Install nosings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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.
   5. Securely attach nosings in place to supporting construction.
   6. Installed nosings must be warrantable. Do not install, correct, or replace nosings in a manner that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install nosings 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed nosings in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

SECTION 05 73 00 – 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.

1.2 SECTION REQUIREMENTS

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. Delegated Design Requirements:
   1. Engineer, fabricate, assemble, and install metal railings that conform to the profiles indicated and other Contract Document requirements; meets specified performance criteria; and result in structurally sound 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.

C. 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.

D. Qualifications:
   1. Fabricator: Company or individuals must have at least 10 years' experience fabricating metal railings installed on at least 100 previous projects similar to this project in size, material, design, and complexity
   2. Installer: Company or individuals must have at least 5 years' experience installing metal railings for at least 30 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 at least 7 years' experience installing metal railings for at least 30 previous projects similar to this project in size, material,

design, and complexity, including at least 2 years' supervisory experience directing and leading metal railing installers.

5. Engineer: Must be a licensed professional structural engineer registered to practice in California having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

E. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and delegated design submittals.

PART 2 - PRODUCTS

2.1 METAL RAILINGS

A. Posts and Rails: Indicated on the Drawings.

B. Infill: Indicated on the Drawings.

C. Handrails: Indicated on the Drawings.

D. Guardrail Brackets: Indicated on the Drawings.

E. Wall Handrail Brackets: "ER8103" extruded aluminum wall mount handrail bracket with 2-1/2-inch projection of from wall to center of handrail, and one 7/16-inch tapped mounting hole, unfinished, manufactured by R&B Wagner, Inc., or equal. Provide spacers where required to prevent crushing finish material.

2.2 MATERIALS

A. 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. Sheet and Plate: ASTM B 209.
      a. Alloy and Temper: 5005-H32 (for anodic finishing), or alloy 3003-H14 (for painted or unfinished sheet).
      b. Minimum Thickness: At least 0.060-inch.
   4. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. 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
3. 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.
4. Shim as required with concealed shims.
5. Dry-pack metal railings supported on concrete and masonry to provide firm, level bearing surfaces.
6. Provide temporary bracing or anchors for items indicated as built into concrete, masonry, or similar construction.
7. Fit exposed connections accurately to form flush hairline joints.
8. Securely attach metal railings in place to supporting construction.

B. 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.

C. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.

2. Repair non-conforming, damaged, and defective work.

D. Protection:
   1. Protect installed metal railings in place from deterioration and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

E. 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 00.

END OF SECTION

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SECTION 05 78 26 – PERFORATED SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Perforated sheet metal.
   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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings, samples.

PART 2 - PRODUCTS

2.1 PERFORATED SHEET METAL

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Coda Architectural Products.
   2. McNichols Co.
   3. Harrington & King Perforating Co.

B. Product: “Round Perforated Metal” manufactured by McNichols Co., or equal.

C. Requisite Properties:
   1. Material: Aluminum.
   2. Size: 60-inch by 120-inch panels.
   3. Thickness: 0.125-inch.
   4. Perforation Size and Shape: 1/4-inch round.
   5. Perforation Arrangement: 3/8-inch staggered centers.
   6. Perforation Spacing: 1/8-inch bar width.
   7. Minimum Open Area: 40 percent open area.
   8. End Pattern: Sheared through both ends.
   9. Finish: Manufacturer’s standard powder coat finish.
   10. Color: Indicated on the Drawings or selected by the Architect.

2.2 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 perforated sheet metal and adjacent items.
   3. Install perforated sheet metal using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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.
   5. Securely attach perforated sheet metal in place to supporting construction.
   6. Installed perforated sheet metal must be warrantable. Do not install, correct, or replace perforated sheet metal in a manner that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install perforated sheet metal 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed perforated sheet metal in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 00 ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, material, and equipment required to complete the Work shown on the Drawings and specified herein, including but not limited to the following:
   1. Wood framing.
   2. Blocking, backing, nailers, sleepers and wood grounds required for securing other Work.
   3. Wood furring.
   4. Sheathing.
   5. Sub-flooring.
   6. Under-layment.
   7. Rough Hardware and Connectors.
   8. Installation of Special Connectors, Seats, Plates, Anchors and Hangers furnished by other trades.

1.2 RELATED SECTIONS

A. Section 03 10 00 - Concrete Formwork.

B. Section 03 30 00 – Concrete

C. Section 04 22 00 – Masonry

D. Section 05 12 00 - Structural Steel.

E. Section 0 550 00 – Metal Fabrications

F. Section 05 40 00 - Cold Formed Metal Framing

G. Section 09 25 00 - Gypsum Wallboard.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00.

B. Certification:
   1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of preservative retained, and conformance with applicable standards.

1.4 QUALITY ASSURANCE

A. Wood Product Quality Standards:

1. Lumber Standards: Comply with Product Standards, PS 20, American Softwood Lumber Standards and West Coast Lumber Inspection Bureau (WCLIB).
2. Plywood Standard: Comply with Product Standards, PS 1, Construction and Industrial Plywood.
3. Pressure Treated Material: American Wood Preservers Association Standards (AWPA).
4. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.

B. Requirements of Regulatory Requirements:
1. California Building Code (CBC) Chapter 23.

C. Do not use power driven fasteners unless approved by Structural Engineer and the City Inspector.

D. Grade Marking:
1. Lumber: Each piece of lumber shall bear the grade mark of at least one of the two agencies, (WCLIB and WWPA) listed above in accordance to CBC Section 2304 and UBC Standard No. 23-1.
2. Plywood: Each sheet shall bear the grade stamp of the American Plywood Association (APA) in accordance to CBC Section 2303.4 and UBC Standard No. 23-2 or 23-3.

E. Contaminated Lumber:
1. Lumber shall not contain any visible mold, mildew, or moisture related spore producing contamination. Lumber shall be inspected before delivery to the site. Lumber delivered to the site with visible signs of contamination shall be removed from the site and shall not be placed into the building structure in any location. On site or off site bleaching or cleaning of lumber showing contamination is not acceptable. If some pieces are contaminated it is assumed that all units in the stack are contaminated.

1.5 PRODUCT HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.6 PROJECT CONDITIONS

A. Coordination: Fit carpentry-work to other Work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other Work.

1. Cooperate with other trades, especially Concrete, Masonry and Miscellaneous Metal, to prevent duplication of rough hardware furnished.

1.7 LEED REQUIREMENTS

1.1 See Division 1 Section “LEED Requirements” for additional LEED requirements.

1.2 LEED Submittals

1. Credit MR7: Certified Wood:
   a. Preferably provide all currently available FSC-Certified wood products for the project.
   b. Provide chain of custody documentation.
2. Credit MR 4.1, 4.2 - Recycled Content:
   a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.

PART 2 – PRODUCTS

2.1 LUMBER, GENERAL

A. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

B. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
   1. Provide dressed lumber, S4S, unless otherwise indicated.
   2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

C. Framing Lumber: Comply with WCLIB, "Standard Grading Rules for West Coast Lumber", No. 17. Stress grades and wood species as noted on Structural Drawings.

2.2 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown.

B. Light Framing and Standard Grade lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

2.3 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1 "U.S Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Structural Sheathing: Structural I.

D. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation. APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than 15/32".

2.4 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.
   1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

2.5 ROUGH HARDWARE

A. Furnish bolts and attachments to other trades for installation in masonry and concrete work.

B. Lag Screws:
   1. General: Conforming to CBC latest edition.
   2. Sizes as indicated on Drawings: Minimum yield point 45,000 psi; minimum tensile strength 77,000 psi.
      a. Dimensions: Standard per Appendix L National Design Specification.
      b. Provide standard cut washer not less in size than screw head, where screw head bears on wood.
      c. Lag screws shall be galvanized where exposed to weather.

C. Washers:

1. Provide not less than a standard cut washer between bolt head, lag screw head, nut and the wood.
2. Washers shall be galvanized where exposed to weather.

D. Framing Connectors: "National Design Specifications for Stress Grade Lumber and Its Fastenings", by the NFPA. , Simpson "Strong Tie", or equal, complete with required nails.
1. Galvanize or shop paint with rust-inhibitive paint.
2. Model Nos. indicated on Drawings.

2.6 WOOD TREATMENT BY PRESSURE PROCESS

A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated", or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber and C9 Plywood) and of AWPA Standards listed below. Mark each treated item with the AWPA Quality Mark Requirements. Each piece shall bear the stamp of an approved independent agency operating under ALSC overview

B. Preservative Treated Wood Products:
1. Water-borne salt preservatives for painted, stained, or exposed natural wood product:
a. AWPA C-2, above ground application.
b. AWPC LP-22, ground contact application.
2. Do not use creosote.
3. Whenever necessary to cut, notch, dap, or drill treated lumber. Paint new surfaces thoroughly with two saturating coats with the preservative material used in the treatment of lumber.
4. Re-dry items to maximum moisture content of 19%, stamped "dry".
5. Do not treat Douglas Fir Coast Region with ACC or CCA.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that surfaces to receive rough carpentry materials are prepared to require grades and dimensions.

3.2 GENERAL

A. Conduct Work under direction of capable experienced foreman.

B. Accurately locate members to line and dimension. Ensure full contact of timbers framed together. Ensure let-in members in full contact on two surfaces.

C. Discard units of material with defects, which might impair quality of Work, and units, which are too small to use in fabricating Work with minimum joints or optimum joint arrangement.

D. Set carpentry works to required levels and lines, with members plumb and true and cut and fitted.

E. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

F. Counter-sink the nail heads on exposed carpentry work and fill holes.

G. Cutting and Fitting: Take care to fit members carefully into their respective positions. Do cutting and fitting in framing required by tradesmen engaged on the operation to enable them to properly carry out their work, but do not curring that may weaken any vital parts of the building. Exercise due care in framing so that structural timbers will not require to be cut for pipes, vents and ducts. Obtain approval of Architect prior to cutting or notching structural members.

H. Bracing and Shoring: Provide all supports, guys and braces, required to stabilize structure during construction.

I. Accurately saw-cut and fit lumber into position and securely nail, spike, lag bolt, or bolt as required.

J. Nailing: Refer to details and tables on Drawings for specific nailing requirements. In absence of specific instructions, use 16d nails for two-inch thick material and 8d for one-inch thick material. Drill nail holes 75% of nail diameter where splitting occurs, and for 20d and larger nails. Replace split or otherwise damaged structural members. Machine applied nailing shall be allowed provided satisfactory installation is demonstrated on the job and the acceptance of the Structural Engineer obtained prior to the use of machine applied nails. Approval is subject to continued satisfactory performance. All "shiners" shall be removed.

K. Bolting: Provide and install all bolts extending through one or more wood members. Drill bolt holes 1/32 inch larger than bolt diameter, with member held in place true to line. Ensure full engagement or nut, but projection of bolt beyond shall not exceed one bolt diameter. Tighten bolts when installed and again immediately before concealing with further construction, or upon completion of Work. Provide malleable iron or steel plate washers under the head and nuts of bolts, where bearing on wood.

L. Lag Screws: Lubricate with soap or other lubricant to facilitate insertion. Turn lag screws into place without driving. Ensure penetration into the lagged member of eight diameters minimum. Provide lead holes for lag screws as follows:

1. Shank Portion - Same diameter and length as shank.
2. Thread Portion - 60-75 percent of shank diameter and at least same length as threaded portion.

Tighten lag screws at installation; carefully retighten just prior to concealing with further construction, or upon completion of Work.

M. Bolts:

1. Machine and carriage bolts conforming to ASTM A 307, Grade A.
    a. Sizes and type as indicated on Drawings.
    b. Provide washers not less in size than bolt heads or nuts bearing on wood.
    c. All bolts, nuts, and washers exposed to weather shall be galvanized in compliance with ASTM A153.

N. Nails:

1. Conforming to CBC Section 2304.8.3.2 and Table 23-II-B-1 (based on Federal Specification FF-N-105B), sizes as indicated on drawings and type as noted below.
    a. Wood framing connections: Bright steel common wire nails. Use galvanized steel common wire nails where connection is exposed.
    b. Plywood floor sheathing to wood framing: Bright steel annulary grooved nails.
    c. Gypsum wallboard to wood framing: Cement coated cooler nails.
    d. Cabinetry: bright steel finishing nails.

O. Wood Screws:

1. Conforming to the NDS (based on Federal Specification FF-N-105B).
    a. Sizes and types as indicated on Drawings.
    b. Screws shall be zinc plated.
    c. Screws shall be of sufficient strength to cause failure in the wood rather than the metal.

3.3 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

A. Provide wherever shown and where required for screeding or attachment of other Work. Form to shapes as shown and cut as required for true line and level of Work to be attached. Coordinate location with other Work involved.

B. Attach to substrates as required to support applied loading. Counter-sink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

D. Provide backing and blocking for installation of mechanical, electrical, plumbing, panels, equipment, cabinets, and hardware. Securely nail accurately in position as required. Use metal framing anchors for connection of blocking and stripping for support of suspended fixtures.

E. Back prime wood bucks and screeds for doors and openings before installation.

F. Securely nail furring and stripping as required, shim accurately to line, level and surface.

3.4 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required tolerance of finished Work.
   1. Fire-stop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Plaster Lath: Unless otherwise indicated, provide 1" x 2" furring at 16" o.c., vertically.

C. Suspended Furring: Provide size and spacing shown, including hangers and attachment devices. Level to a tolerance of 1/8" in 10', except 1/4" in 10' for thick-coat plasterwork.

3.5 SILLS AND PLATES

A. Install pressure preservative treated lumber for plates and sills in conformance with CBC latest edition.

3.6 WOOD FRAMING, GENERAL

A. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule"

B. Fire-stop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where fire-stops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2" thick lumber of the same width as framing members.

3.7 STUD WALLS, PARTITIONS, AND FURRING

A. Provide studs in continuous lengths without splices.

B. Plates: Provide single bottom plate and double top plate unless noted otherwise on drawings and details. Stagger joints four feet in top plates.

C. Nail or anchor plates to supporting construction.

D. Corners and Intersections: Frame with three studs or as detailed.

E. Openings: Frame with double studs each side and double headers placed on edge, resting on cripple studs. Truss or block over headers.

F. Provide continuous horizontal blocking row at mid-height of single-story partitions over eight feet high and at midpoint of multi-story partitions, using two inch thick members of same width as wall or partitions.

G. Cut-in blocks wherever necessary for bracing or backing for applied finish or fixtures. Cut-in two-inch solid blocking between studs at all horizontal joints in non-structural plywood wall sheathing.

H. Provide continuous perimeter backing at ceiling plane for longitudinal forces of wall-secured suspended ceiling system.

3.8 ROOF AND CEILING FRAMING

A. Joists and Rafters: Lay with crowning edge up with full end bearing.

B. Openings: Frame for hatches, vents, and other openings as required.

C. Bridging: Install 2 x 3 bridging at ten feet maximum on centers at joists over eight inches in depth. Install 2 x 3 cross bridging or two inch solid blocking, between roof rafters and ceiling joists. Approved metal cross-bridging nailed using all nail holes may be used in lieu of 2 x 3 bridging. Do not nail bottom of cross bridging at roof rafters until after installation of roof sheathing.

D. Solid Blocking: Install between roof rafters and ceiling joists over partitions and at end supports as indicated.

E. Plywood Roof Sheathing: Install plywood over rafters or decking as indicated on Drawings. Thickness, nailing and layout shall be as indicated on Structural Drawings.

F. Provide special framing as shown for eaves, overhangs, dormers and similar conditions, if any.

3.9 MISCELLANEOUS FRAMING

A. Framing for Mechanical Work:
   1. Install where indicated and as required to conceal piping, structural metal work and other unfinished Work where metal furring is not indicated. Furring shall be 2 x studs or as required.
   2. Frame members for passage of pipes and ducts to avoid cutting structural members.
   3. Do not cut, notch, or bore framing members for passage of pipes or conduits except as detailed on approved Structural Drawings.
   4. Reinforce framing members where damaged by cutting

END OF SECTION

SECTION 06 10 53 – 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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings.

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 least 1-1/4-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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. Verify in-place supporting and adjacent construction satisfies all conditions that might affect the quality of installation or the durability or performance of installed and adjacent items.
3. Fit rough carpentry to other construction. Scribe and cope as needed for accurate fit. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
4. Set rough carpentry true to line; plumb, level, and square without warp or rack; with flush, well-fitted joints; and in alignment with adjacent construction.
5. Securely attach rough carpentry in place to supporting construction.

B. Special Techniques:
1. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
2. Provide blocking and framing as indicated and as 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 framing or blocking 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 and where 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. Installation Tolerances: Install framing within the following tolerance variations.
1. Maximum Out of Plumb: Not more than 1/4-inch in 10 feet.
2. Maximum Out of Plane: Fastening surfaces of adjacent framing members may not vary by more than 1/8-inch.
3. Maximum Positional Tolerance: Not more than 1/4-inch. Cumulative error may not exceed minimum fastening requirements of sheathing or other finishing materials.

D. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.

END OF SECTION

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SECTION 06 16 43 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing sheathing for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing sheathing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading sheathing installers.

B. Submittals: Submit product data, shop drawings, and written descriptions of specified qualifications.

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 least 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 sheathing and adjacent items.

3. Install sheathing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. 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.
5. Perform cutting and fitting as required or necessary for an accurate fit and complete installation.
6. Securely attach sheathing in place to supporting construction.
7. 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 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. Panel and Penetration Joint Treatment:
   1. Panel Joint and Penetration Treatment for Long-Term Wind and Water Protection (Partially-Controlled Enclosure):
      a. Promptly after sheathing is installed, apply glass mesh joint tape to panel joints and penetrating items.
      b. Center tape over sheathing panel joints and on perimeter openings surrounding penetrating items.
      c. Provide an overlap at intersections at least equal to the tape width.
      d. 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.
      e. With a trowel, compress and embed the sealant into the entire surface of the tape creating a continuous, flat, and level surface.
      f. Fastener Treatment: Apply sealant or liquid flashing to each exposed fastener; trowel level and smooth.
   2. 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.

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 and from plumb, level, and alignment.

E. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

F. Protection:
   1. Protect installed sheathing in place from soiling, deterioration, and damage until Substantial Completion.
   2. 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 13 26 – SASM WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. SASM waterproofing.
   2. Protection layers and drainage panels.
   3. Site tests and inspections.
   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 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing waterproofing installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have at least 5 years' experience installing waterproofing for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing waterproofing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading waterproofing installers.
   4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

B. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and manufacturer's representative reports.

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; substrates and surface preparation; installation sequence; procedures for protecting stored materials and installed waterproofing; and requirements for testing, inspection, reports, and closeout submittals.

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 waterproofing. 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. 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 waterproofing 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 D 4263.
3. Test waterproofing 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 waterproofing 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.

E. Warranty:
1. 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.
2. 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. Carlisle Coatings and Waterproofing Inc. (MIRADRI 860/861)
2. CETCO Building Materials Group. (ENVIROSHEET)
3. GCP Applied Technologies. (BITUTHENE 4000)

4. Henry Co. (BLUESKIN WP 200)

2.2 WATERPROOFING MEMBRANE

A. Description: Self-adhering cross-laminated high-density polyethylene (HDPE) composite sheet/rubberized asphalt adhesive flashing membrane, with release liner on the adhesive side.

B. Applications: Positive side basement walls and other vertical sub-structure conditions, including below-grade sump and elevator pits.

C. Restrictions: SASM waterproofing may not be installed over LWIC.

D. Product: “Bituthene 4000” manufactured by GCP Applied Technologies, or equal.

E. Requisite Properties:
   1. Minimum Thickness: At least 1/16-inch.
   2. Minimum Roll Width: At least 36 inches.
   3. Maximum UV Exposure Limit: Not more than 21 calendar days.
   4. Maximum High Temperature Application: Up to 135 deg. F.
   5. Color: Dark gray-black.

F. Performance Requirements:
   1. Minimum Membrane Tensile Strength: At least 320 pounds per square inch, when tested in conformance with ASTM D 412 modified.
   2. Minimum Elongation: At least 300 percent, when tested in conformance with ASTM D 412 modified.
   3. Minimum Film Tensile Strength: At least 5,000 pounds per square inch, when tested in conformance with ASTM D 882 modified.
   4. Maximum Water Vapor Transmission: Not more than 0.05-perm, when tested in conformance with ASTM E 96, Section 12. (water method)
   5. Minimum Peel Adhesion: At least 8 pounds per inch, when tested in conformance with ASTM D 903 modified.
   6. Minimum Lap Adhesion: At least 5 pounds per inch width, when tested in conformance with ASTM D 1876 modified.
   7. Minimum Puncture Resistance: At least 50 pounds, when tested in conformance with ASTM E 154.
   8. Maximum Water Absorption: Not more than 0.1 percent, when tested in conformance with ASTM D 570.

2.3 INSTALLATION MATERIALS

A. 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.

2.4 PROTECTION BOARD AND DRAINAGE PANELS

A. Protection Board:
   1. Description: Pre-fabricated asphaltic board consisting of mineral filled, high-melt-point asphalt core sandwiched between non-woven glass fiber mats.
   2. Products: “PROTECTION COURSE PC-3 (Heavy Duty)” manufactured by W.R. Meadows, Inc., or equal.
   3. Requisite Properties:
      a. Minimum Thickness: At least 1/4-inch.
      b. UV Exposure Limit: Not more than 21 calendar days.
   4. Adhesive:
      a. Description: fast drying solvent-based rubber cement
      b. Application Used for adhering protection boards to waterproofing membrane.
      c. Product: “Bituthene Protection Board Adhesive” manufactured by GCP Applied Technologies, or equal.

B. Drainage Panels:
   1. Description: Preformed geocomposite drainage sheet system consisting of a hollow studded polystyrene core covered on one side with a non-woven, needle punched polypropylene filter fabric; and on the other side with a smooth polymeric sheet (vertical applications) or a high backing film (horizontal applications).
   2. Product: “Hydroduct 220” manufactured by GCP Applied Technologies, or equal.
   3. Requisite Properties:
      a. Nominal Thickness: 3/8-inch thick
      b. Maximum UV Exposure Limit: Not more than 10 calendar days.

2.5 ACCESSORIES

A. Substrate Repair and Leveling Agent:
   1. Description: Low viscosity, 2-component, asphalt modified urethane coating.
   2. Application: Used as a leveling agent for rough concrete decks and for non-structural repair of defects in concrete decks.
   3. Product: “Bituthene Deck Prep” manufactured by GCP Applied Technologies, or equal.

B. 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.

C. Termination Bar: Extruded or roll-formed aluminum bar having both pre-punched holes for anchors and an upper flange to receive sealant.

D. Fasteners: Stainless steel fasteners and at least 3/4-inch diameter washers installed in pre-drilled holes.

E. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with waterproofing adhesion,
4. 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.
5. Install waterproofing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
6. Completed work must match approved samples and mockups, as accepted by the Architect.
7. Installed waterproofing must be warrantable. Do not install, correct, or replace waterproofing in a manner that results in any warranty or guarantee becoming void.

B. Special Techniques:
   1. Waterproofing Installation:
      a. Start installation with manufacturer's technical representative present.
      b. Apply primer over prepared substrate at manufacturer's recommended rate and allow drying.
      c. Accurately align waterproofing membrane and maintain at least 6-inch uniform side and end laps sealed with continuous liquid flashing. Stagger end laps.
      d. Shingle waterproofing membrane side laps in the direction of substrate slope.
      e. Repair tears, voids, and lapped seams by cutting out the damaged areas and installing a membrane patch that extends beyond the damaged area at least 6 inches in all directions over well-bonded and undamaged membrane. Seal patch edges with continuous liquid flashing.
   2. Drainage Panel Installation:
      a. Place and secure molded-sheet drainage panels to substrate in conformance with the manufacturer's instructions.
      b. Use adhesives that do not penetrate waterproofing.
      c. Lap edges and ends of geotextile to maintain continuity.
      d. Protect installed molded-sheet drainage panels during subsequent construction.

C. 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.
   2. Required Tests:
      a. 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. Flood Testing: After waterproofing is complete, but before overlying construction is placed, each deck area is flood tested for leaks in conformance with ASTM D 5957.
   3. 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.

D. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.

E. Protection:
   1. Protect installed waterproofing in place from deterioration, and damage until Substantial Completion.
   2. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

SECTION 07 14 13 – HFA RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. HFA rubberized asphalt waterproofing.
   2. Protection layers and drainage panels.
   3. Site tests and inspections.
   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 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing waterproofing installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have at least 5 years' experience installing waterproofing for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing waterproofing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading waterproofing installers.
   4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

B. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and manufacturer's representative reports.

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; substrates and surface preparation; installation sequence; procedures for protecting stored materials and installed waterproofing; and requirements for testing, inspection, reports, and closeout submittals.

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 waterproofing. 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. 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 waterproofing 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 waterproofing 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 waterproofing 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.

E. Warranty:
1. 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.
2. 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. American Hydrotech, Inc.
2. Carlisle SynTec.
3. Henry Co.
4. Tremco, Inc.

2.2 WATERPROOFING MEMBRANE

A. Products: “MM6125” manufactured by American Hydrotech, Inc., or equal.

B. Requisite Properties:
   1. Material: Must contain 100-percent solids by weight.
   2. Minimum Thickness: At least 215 mils.
   3. Maximum UV Exposure Limit: Not more than 30 calendar days.

C. Performance Requirements:
   1. Flash Point: Not more than 500 deg. F or less than 45 deg. F above manufacturer's maximum recommended application temperature.
   2. Maximum Cone Penetration: Not more than 100mm at 77 deg. F, and not more than 200mm at 122 deg. F.
   3. Maximum Flow: Not more than 3.0mm at 140 deg. F.
   4. Minimum Toughness: At least 15 Joules
   5. Minimum Ratio of Toughness to Peak Load: At least 0.065.
   6. Adhesion Rating: Pass at 0 deg. F.
   7. Maximum Water Vapor Permeance: Not more than 1.7 ng/Pa(s)sq.m.
   8. Maximum Water Absorption: Not more than 0.35g mass gain or more than 0.18g mass loss.
   9. Low-Temperature Flexibility: No delamination, adhesion loss, or cracking at minus 13 deg. F.
   10. Crack Bridging Capability: No cracking, adhesion loss, or splitting at minus 13 deg. F.
   11. Heat Stability: No change in viscosity, penetration, flow or low-temperature flexibility when heated for 5 hours at the manufacturer's recommended application temperature.
   12. Viscosity Test: Between 2 and 15 seconds.

2.3 PROTECTION LAYERS AND DRAINAGE PANELS

A. Protection Sheets: Provide the following products manufactured by American Hydrotech, Inc., or equal.
   1. Short Term Protection Sheet (up to 30 days UV exposure): “Hydroflex 30”, or equal, 85-mil thick heavy-duty, rubberized asphalt protection sheet with synthetic fiber reinforcement.
   2. Medium Term Protection Sheet (up to 180 days UV exposure): “Hydrocap 90FR”, or equal, 130-mil thick heavy-duty, rubberized asphalt protection sheet with fiberglass reinforcement and a fire rated, non-combustible, ceramic granular surface.
   3. Long Term Protection Sheet (more than 180 days UV exposure): “Hydrocap 160FR”, or equal, 160-mil thick heavy-duty, rubberized asphalt protection sheet with polyester or a combination polyester and fiberglass reinforcement and a fire rated, non-combustible, ceramic granular surface.

B. Root Barrier: “Root Stop HD” 30-mil thick polyethylene geo-membrane sheeting manufactured by American Hydrotech, Inc., or equal.

C. Drainage Panels:
   1. Horizontal Applications: “Hydrodrain 700” 3-dimensional, crush-proof composite drainage mat manufactured by American Hydrotech, Inc., or equal.
   2. Vertical Applications: “Hydrodrain 700” 3-dimensional, crush-proof composite drainage mat manufactured by American Hydrotech, Inc., or equal.
   3. Low Profile Drainage Composite: “Hydrodrain 1000’ 3-dimensional, crush-proof composite drainage mat manufactured by American Hydrotech, Inc.
   4. High Compression Drainage Composite: “VersiCell’ manufactured by Tournesol Siteworks, or equal.

2.4 ACCESSORIES

A. Surface Conditioner/Primer: Water-based asphalt-emulsion primer conforming to ASTM D 41 and supplied, required, recommended, or accepted by the manufacturer for use in conditioning substrates for both waterproofing and flashings.

B. Membrane Reinforcement:
   1. Horizontal Applications: “Flex-Flash F” 1.35 ounce per square yard spunbonded polyester fabric manufactured by American Hydrotech, Inc., or equal.
   2. Vertical Applications: “Flex-Flash FV” 2.4 ounce per square yard, 10x10 open-weave, spunbonded polyester fabric manufactured by American Hydrotech, Inc., or equal.

C. Flexible Flashing/Heavy Duty Reinforcing Sheet: “Flex-Flash UN” 60-mil thick uncured polychloroprene (Neoprene) sheet manufactured by American Hydrotech, Inc., or equal.

D. Liquid Flashing:
   1. Description: 2-component, monolithic, self-flashing and self-adhering reinforced poly methyl-methacrylate (PMMA) resin flashing membrane.
   2. Product: “HydroSeal Resin Liquid-Applied Flashing” manufactured by American Hydrotech, Inc., or equal,
      a. Flashing Membrane: “HydroSeal Matrix”, or equal.
      b. Reactive Agent for Resin and Primers: “HydroSeal Catalyst”, or equal.
   3. Accessories:
      a. Primer: “HydroSeal Primer”, or equal, for concrete, masonry, wood, asphalt, and other substrates; and “HydroSeal Primer-Metal”, or equal, for metal substrates.
      b. Topcoat and Sealer: “HydroSeal Finish White”, or equal.
      c. Cleaning Agent and Activator: “HydroSeal Activator”, or equal.
      d. Patching and Repair Compound: “HydroSeal Paste”, or equal.

E. Termination Bar: Manufacturer’s standard nominal one inch by 1/8-inch thick stainless steel having both pre-punched holes for anchors and an upper flange to receive sealant.

F. Fasteners: Stainless steel fasteners and at least 3/4-inch diameter washers installed in pre-drilled holes.

G. Adhesive: Manufacturer's recommended contact adhesive to bond flashing sheets together and to bond flashing sheet to an approved substrate.

H. Sealant: Provide manufacturer's recommended sealant to seal exposed edges of flashing.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
   3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with waterproofing adhesion,
   4. 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.
   5. Install waterproofing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   6. Completed work must match approved samples and mockups, as accepted by the Architect.
   7. Installed waterproofing must be warrantable. Do not install, correct, or replace waterproofing in a manner that results in any warranty or guarantee becoming void.

B. 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.
   2. Required Tests:
      a. 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. Flood Testing: After waterproofing is complete, but before overlying construction is placed, each deck area is flood tested for leaks in conformance with ASTM D 5957.

C. Correction and Repair:

1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.

D. Protection:
1. Protect installed waterproofing in place from deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

E. 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.

END OF SECTION

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SECTION 07 25 14 – ASPHALT SHEET WEATHER-RESISTIVE BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphalt-saturated sheet weather-resistive barriers.
   2. Self-adhering sheet flashings integral to sheet weather-resistive barriers.
   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 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing WRBs installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have at least 5 years' experience installing WRBs for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing WRBs for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading WRB installers.
   4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

B. Submittals: Submit product data, shop drawings, and written descriptions of specified qualifications.

C. 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.

D. 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.

E. 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.

F. Warranty:
1. 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.
2. 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 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.

2.2 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 WRBs and adjacent items.
   3. Install WRBs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. Perform cutting and fitting as required or necessary for an accurate fit and complete installation.
   5. Securely attach WRBs in place to supporting construction.
   6. 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. Interface with Adjacent Items: Provide materials, components, and accessories normally furnished or necessary to attach WRB tightly 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed WRBs in place from soiling, deterioration, and damage until covering.
   2. Remove protection when it's no longer needed and before covering.

E. 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.

END OF SECTION

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SECTION 07 46 46 – FIBER CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fiber cement siding.
   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 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing siding for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing siding for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading siding installers.

B. Submittals: Submit product data, shop drawings, samples, and written descriptions of specified qualifications.

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 siding. 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. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate siding into the mockup as part of the work of this specification section.

E. 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 FIBER CEMENT SIDING

A. Description: Siding manufactured from fiber-cement board that does not contain asbestos fibers, and conforms to ASTM C 1186, Type A (sheets are intended for exterior applications, subjected to the direct action of sun, rain, or snow), Grade III.

B. Products: “Artisan Siding” manufactured by James Hardie, or equal.
   1. Siding Texture: “Square Channel”.
   2. Thickness: 0.625-inch.
   3. Width: 10.250-inches.
   4. Length: 144-inches.
   5. Exposure: 9 inches.
   6. Finish: Primed for paint.
   7. Color: Indicated on the Drawings or selected by the Architect.

2.2 ACCESSORIES

A. Cut Edge Sealer: Provide as supplied, recommended, approved, or accepted by the manufacturer for field-cut edges.

B. Fasteners: Field finished fasteners, custom color matching siding.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 siding and adjacent items.

3. Install siding using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. 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.
5. Securely attach siding in place to supporting construction.
6. Installed siding must be warrantable. Do not install, correct, or replace siding in a manner that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install siding 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.

C. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Repair damaged finishes. Restore finishes so that no evidence remains of corrective work. Return to the factory those items that either cannot be refinished in the field, or that contain components that cannot be refinished in the field. Make required alterations and either refinish the entire item or provide a new item.

D. Protection:
1. Protect installed siding in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 54 19 – 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 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing roofing installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have at least 5 years' experience installing roofing for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing roofing for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading roofing installers.
   4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

B. Submittals: Submit product data, shop drawings, samples, written descriptions of specified qualifications, and manufacturer's representative reports.

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 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.

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 D 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.

E. Warranty:
1. 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.
2. 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 EnergySmart” membrane manufactured by Sika Corp., or equal. (ICC-ES Report No. ESR-1157 and Los Angeles Research Report No. RR 24852).

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 17.5 pounds-force, when tested in conformance with ASTM D-751.
   2. Minimum Elongation: At least 250 percent (machine direction) and 200 percent (cross direction), when tested in conformance with ASTM D-751.
   3. Minimum Seam Strength: At least 75 percent of tensile strength, when tested in conformance with ASTM D-751.
   4. Minimum Tearing Resistance: At least 17.5 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 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
   3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with roofing adhesion,
   4. 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.
   5. Install roofing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   6. Only install roofing under conditions that ensure membrane is free from blemishes and defects.
   7. Completed work must match approved samples and mockups, as accepted by the Architect.
   8. 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. 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.
   2. Required Tests:
      a. 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. 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.
      c. Electric Field Vector Mapping (EFVM) Testing: After roofing is complete, but before overlying construction is placed perform EFVM testing.
      d. Flood Testing: After roofing is complete, but before overlying construction is placed, each deck area is flood tested for leaks in conformance with ASTM D 5957.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.

2. Repair non-conforming, damaged and defective work.

END OF SECTION

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SECTION 07 62 00 – 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.

1.2 SECTION REQUIREMENTS

A. 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.

B. Qualifications:
   1. Fabricator: Company or individuals must have at least 10 years' experience fabricating flashings installed on at least 100 previous projects similar to this project in size, material, design, and complexity
   2. Installer: Company or individuals must have at least 5 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading flashing installers.
   4. Engineer: Must be a licensed professional structural engineer registered to practice in California having at least 10 years' experience performing the kind of engineering services indicated for at least 20 previous projects similar to this project in size, material, design, and complexity.

C. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and delegated design submittals.

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.

E. 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.

F. 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.

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 Coil and Sheet: ASTM A 755.
   1. Sheet: Aluminum 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 either a solid color coat applied to a DFT of at least 0.75-mil; or a metallic color coat applied to a DFT of at least 0.75-mil and a clear topcoat applied to a DFT of at least 0.50-mil, as indicated on the Drawings or selected by the Architect.
   3. Reverse Side Finish: 0.25-mil DFT acrylic bottom side primer and polyester wash coat (backer coat).
   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.

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 aluminum sheet ASTM B 209, 5005-H32 (for anodic finishing) and 3003-H14 (for painted or unfinished sheet). Gutters to be concealed.
5. Downspouts: Fabricate from aluminum sheet ASTM B 209, 5005-H32 (for anodic finishing) and 3003-H14 (for painted or unfinished sheet). Downspouts to be concealed.

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. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. 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
3. Scribe and cope items as necessary for an accurate fit. Perform required cutting, drilling, and fitting for flashing installation.
4. 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.
5. Shim as required with concealed shims.
6. Securely attach flashings in place to supporting construction.

B. 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 trim in conformance with performance requirements and 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 recommendations of the SMACNA quality standard publication. 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 recommendations of the SMACNA quality standard publication 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.

C. 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.

D. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged, and defective work.

E. Protection:
1. Protect installed flashings in place from deterioration and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 07 65 26 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing flashings installed on at least 200 previous projects similar to this project in size, material, design, and complexity.
   2. Installer: Company or individuals must have at least 5 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity.
   3. Supervisors: Individuals must have at least 7 years' experience installing flashings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading flashing installers.
   4. Manufacturer's Representative: Individuals must have at least 5 years' technical field experience performing manufacturer's services for at least 50 previous projects similar to this project in size, material, design, and complexity.

B. Submittals: Submit product data, shop drawings, and written descriptions of specified qualifications.

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. 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.

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

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. Applications: Roof detail areas, including under equipment flashings, as ice dam protection, at roof valleys and rake edges, and around chimneys and skylights.
3. Restrictions: May not be used
   a. in contact with polysulfides;
   b. in contact with flexible PVC or vinyl windows; and
   c. with high concentrations of resin (pitch) that may be found in some wood plank decks.
4. Products: "Grace Ultra" manufactured by GCP Applied Technologies, or equal.
5. 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. Color: Gray-black.
6. Performance Requirements:
   a. Minimum Membrane Tensile Strength: At least 250 pounds per square inch, when tested in conformance with ASTM D 412, Die C modified.
   b. Minimum Membrane Elongation: At least 250 percent, when tested in conformance with ASTM D 412, Die C modified.
   c. Minimum Low Temperature Flexibility: Unaffected to at least -2 deg. F , when tested in conformance with ASTM D 1970.
   d. Minimum Adhesion to Plywood: At least 3.0 pounds per inch of width, when tested in conformance with ASTM D 903.
   e. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.

3. Verify substrates are dry and free of curing compounds, sealers, hardeners, and deleterious and other substances that might interfere with flashing adhesion,
4. 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.
5. Install flashings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
6. Only install flashings under conditions that ensure they are free from blemishes and defects.
7. Completed work must match approved samples and mockups, as accepted by the Architect.
8. 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. 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.
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.

D. 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.

E. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.

F. Protection:
   1. Protect installed equipment in place from deterioration, and damage until covering.
   2. Remove protection when it's no longer needed and before covering.

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.
   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.

END OF SECTION

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SECTION 07 92 00 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing joint sealants for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing joint sealants for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading joint sealant installers.

B. Submittals: Submit product data, samples, and written descriptions of specified qualifications.

C. 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).

D. 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: Indicated on the Drawings or selected by the Architect.

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

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
   3. Protect work areas from dust and other airborne contaminants during surface preparation and joint sealant installation. Protect adjacent surfaces against soiling and damage.
   4. 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.
   5. 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.
   6. Only install joint sealants under conditions that ensure finishes are free from blemishes and defects.
   7. 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.

8. Completed work must match approved samples and mockups, as accepted by the Architect.
9. 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.
   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 comply with the following and at the same time backings are installed:
   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.

C. 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.
   2. Non-Destructive Testing:
      a. The center of sealant beads are depressed with a 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.
   3. Destructive Testing:
      a. A 6-inch-long tail of sealant is cut loose from substrate.
      b. The tail is marked one inch from the beginning of the adhesive bond away from the cut tail.
      c. The tail 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.

4. 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.

D. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled joint sealants that cannot be cleaned to the same condition as new.

E. Protection: Protect installed joint sealants in place from soiling, deterioration, and damage until Substantial Completion.

3.2 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.
   2. Porous Substrate Stain Testing: Procedures must conform to ASTM C 510.
   3. Non-Destructive Spot Testing: Procedures must conform to ASTM C 1521.
   4. Non-Destructive Continuous Inspection: Procedures must conform to ASTM C 1521.
   5. Destructive Testing: Procedures must conform to ASTM C 1521.

END OF SECTION

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DIVISION 08

OPENINGS

SECTION 08 12 13 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Manufacturer: Company or individuals must have at least 10 years' experience manufacturing door frames installed on at least 200 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 at least 5 years' experience installing door frames for at least 30 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 at least 7 years' experience installing door frames for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading door frame installers.

B. Submittals: Submit product data, door schedule, shop drawings, and written descriptions of specified qualifications.

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. 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*".

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.

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 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 door frames and adjacent items.
   3. 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.
   4. 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.
   5. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
   6. Securely attach door frames in place to supporting construction.
   7. 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 are 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.

C. 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 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.

D. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

E. Protection:
1. Protect installed door frames in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 13 13 – 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.

1.2 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 door frames and adjacent items.
   3. 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.
   4. 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.
   5. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
   6. Securely attach door frames in place to supporting construction.
   7. 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 are 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.

C. 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 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.

D. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

E. Protection:
1. Protect installed door frames in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

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. Individual Office Doors: Level 1 (standard-duty), Model 1 (full flush).
      e. Bathroom Doors: Level 1 (standard-duty), Model 1 (full flush).
   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 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 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 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 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 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. 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. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 doors and adjacent items.
   3. 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.
   4. 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.
   5. Perform drilling and fitting as required or necessary for an accurate fit and complete installation.
   6. Securely attach doors in place to supporting construction.
   7. 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. 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.

C. Adjusting:
   1. Lubricate and adjust doors and hardware to function properly, free from warp, twist, binding, and distortion.
   2. Confirm latches and locks engage securely without forcing or binding.

D. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

E. Protection:
   1. Protect installed doors in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 08 31 16 – 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 SECTION REQUIREMENTS

A. Submittals: Submit product data and shop drawings.

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 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.

C. 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.

D. 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.

E. 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. 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 access panels and adjacent items.

3. Install access panels using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. 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
5. Securely attach access panels in place to supporting construction.
6. 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. 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 and from plumb, level, and alignment.

C. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
1. Protect installed access panels in place from soiling, deterioration, and damage until Substantial Completion.
2. 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.
2. Cylinders for doors fabricated with locking hardware.

B. Related Divisions:

1. Division 06 – door hardware installation
2. Division 07 – Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Division 08 – metal doors and frames.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Access doors and panels.

1.2 REFERENCES:

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
   a) ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties.
2. BHMA – Builders Hardware Manufacturers Association
3. 2022 California Building Code.
   a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
4. DHI – Door and Hardware Institute.
5. WHI – Warnock Hersey Incorporated State of California Building Code
6. Local applicable codes
7. SDI – Steel Door Institute
8. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers: see table at 2.1.A of this section.
2. Finishes: see 2.6 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS**:** Submit electronic copy of schedule. 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.

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 hardware consultant, 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. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

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. Note: Careful coordination required for reinforcement/blocking for wall stop support. If random inspection yields an unsupported wall stop, all locations will be rebuilt at no expense to the Owner or Architect.
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. Coordinate: flush top rails of doors at out swinging exteriors, and throughout where adhesive-mounted seals occur.
6. 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.

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 to validate warranty information, required for Owner in making future warranty claims:

C. Minimum warranties:

1.	Mortise Locksets:	Ten years mechanical Three years electrical
2.	Closers:	Thirty years mechanical
3.	Hinges:	One year
4.	Continuous Hinges	Lifetime, One year for electrified
5.	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.

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
Closers	(LCN) LCN	Owner standard
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Thresholds	(ZER) Zero	NGP, Pemko
Seals & Bottoms	(ZER) Zero	NGP, Pemko

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. 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.

C. Conventional Hinges: Steel or stainless-steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Out-swinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. 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 powder coat 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.

E. Pivots**:** high-strength forged bronze or stainless steel, tilt-on precision bearing and bearing pin.

1. Bottom and intermediate pivots**:** adjustability of minus 0.063 inch, plus 0.125 inch.

F. Floor Closers**:** hydraulically controlled, cement case, maximum degree dead stop permitted by trim or adjacent structure. Special pins, floor pans and longer spindles when needed to accommodate floor and jamb conditions.

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. Deadbolts**:** stainless steel 1-inch throw.
9. Strikes**:** 16 gage curved steel, bronze or brass with 1-inch-deep box construction, lips of sufficient length to clear trim and protect clothing.
10. Scheduled Lock Series and Design**:** Schlage L series, 06A design.
11. Certifications**:**

    a) ANSI A156.13, 1994, Grade 1 Operational.
    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

12. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2022 11B-404.2.7 and 11B-309.4.
13. Accepted substitutions**:** None.

2.4 CLOSERS

A. Surface Closers**:** 4040XP

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.
1. ISO 2000 certified. Units stamped with date-of-manufacture code.
2. Independent lab-tested 10,000,000 cycles.
3. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
4. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
5. 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 2022 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.

6. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
7. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
8. Exterior door closers**:** tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
9. Exterior doors**:** seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
10. Non-flaming fluid will not fuel door or floor covering fires.
11. Pressure Relief Valves (PRV) not permitted.
12. Accepted substitutions**:** None.

2.5 OTHER HARDWARE

A. Automatic Flush Bolts**:** Low operating force design.

B. 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.

C. 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.

D. Seals**:** Four-fingered type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb. Adhesive warranted for life of installation.

1. Proposed substitutions**:** submit for approval.
2. Three-fingered type at hinge jambs of doors fitted with continuous hinges where jamb leaf of hinge is fastened to the frame reveal.

E. Thresholds**:** As scheduled and per details. Comply with CBC 2022 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. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws**:** full thread. Sleeve nuts**:** full length to prevent door compression.

2.6 FINISH**:**

A. Generally**:** BHMA 630 Stainless steel.

1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers**:** factory powder coated to match other hardware, unless otherwise noted.

2.7 KEYING REQUIREMENTS**:**

A. Key System**:** (Verify with Owner) Schlage Everest utility-patented keyway, interchangeable core. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway(s), keybow styles, structure and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.

B. Keys

1. Existing factory registered master key system.
2. Construction keying**:** furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
3. Furnish 10 construction keys.
4. Furnish 2 construction control keys.
5. Furnish 2 Emergency keys per each L9485 Faculty Restroom Lock

C. Key Cylinders**:** furnish utility patented, 6-pin solid brass construction.

D. Cylinder cores**:** furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

E. Permanent keys**:** use secured shipment direct from point of origination to Owner.

1. For estimate**:** 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
2. For estimate**:** VKC stamping plus "DO NOT DUPLICATE".
3. Bitting List**:** use 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 1008.1.9.2 and 11B-404.2.7.

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. Use manufacturers' fasteners furnished with hardware items or submit Request for Substitution with Architect.
3. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more than 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.

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.

B. 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, 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.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

C. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

Opt. #: OPT0362097-V1

HARDWARE GROUP NO. 01
Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	700	630	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	630	SCH
1	EA	FSIC CORE	23-030 OR PER OWNER STANDARD	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA SRI TBTRX	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L/FS18S AS REQ'D	BLK	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER
1	EA	LATCH GUARD	REED BROTHERS SECURITY FULL HEIGHT LATCH GUARD	630	RED

HARDWARE GROUP NO. 02
Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	700	630	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	630	SCH
1	EA	FSIC CORE	23-030 OR PER OWNER STANDARD	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBTRX	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER
1	EA	LATCH GUARD	REED BROTHERS SECURITY FULL HEIGHT LATCH GUARD	630	RED

HARDWARE GROUP NO. 03
Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	630	SCH
1	EA	FSIC CORE	23-030 OR PER OWNER STANDARD	626	SCH
1	EA	SURFACE CLOSER	4040XP REG SRI TBTRX	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER

HARDWARE GROUP NO. 04
Provide each PR door(s) with the following:

2	EA	CONT. HINGE	700	630	IVE
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	STOREROOM LOCK	L9080T 06A	630	SCH
1	EA	FSIC CORE	23-030 OR PER OWNER STANDARD	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH SRI TBTRX	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	EA	SET SEAL	429AA-S (@ JAMBS)	AA	ZER
1	EA	GASKETING (AT HEAD)	488SBK	BK	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER
1	EA	LATCH GUARD	REED BROTHERS SECURITY FULL HEIGHT LATCH GUARD	630	RED

HARDWARE GROUP NO. 05
Provide each SGL door(s) with the following:

1	EA	CONT. HINGE	700	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	630	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBTRX	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (OMIT @ OVERHANG)	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	547A-223 OR AS DETAILED	A	ZER
1	EA	LATCH GUARD	REED BROTHERS SECURITY FULL HEIGHT LATCH GUARD	630	RED

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 05 16– 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.

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 SECTION REQUIREMENTS

A. 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.

B. Submittals: Submit product data, shop drawings, written descriptions of specified qualifications, and manufacturer's representative reports.

C. Preinstallation Meeting:
   1. MVECS manufacturer's representative and MVECS installer must attend the preinstallation meeting specified in specification section 03 35 10.

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.

D. 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*".

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.

PART 3 - EXECUTION

3.1 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.
   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.
      b. Alkalinity (pH) Testing: Conduct pH test in conformance with ASTM F 710.
      c. RH Probe Test: Conduct *in situ* RH probe testing in conformance with ASTM F 2170

END OF SECTION

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SECTION 09 29 00 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing gypsum board for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing gypsum board for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading gypsum board installers.

B. Submittals: Submit product data, shop drawings, and written descriptions of specified qualifications.

C. 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.

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. "e²XP 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. Texture Finish:

1. Description: Unaggregated texture coating wall and ceiling texture.
2. Restrictions: New concrete and new plaster must age at least 60 days before texturing.
3. Concrete Crack Repair and Surface Preparation: Setting-type compound specified above.
4. Primer: "SHEETROCK FIRST COAT Primer" manufactured by USG Corp., or equal.
5. Texture Product: "SHEETROCK TUF-TEX" manufactured by USG Corp., or equal.
6. Finish: Fine orange peel.

B. Applied Level 5 Wallboard Finish Products: Prohibited.

C. Repair Clips: "SHEETROCK Drywall Repair Clips" manufactured by USG Corp., or equal.

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 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. 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 gypsum board and adjacent items.
3. Install gypsum board using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. 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.
5. Securely attach gypsum board in place to supporting construction.
6. 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. 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 and from plumb, level, and alignment.

D. Correction and Repair:

1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

E. Protection:

1. Protect installed gypsum board in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

3.2 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 91 00 – 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.

1.2 SECTION REQUIREMENTS

A. Submittals: Submit product data, samples, and written descriptions of specified qualifications.

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 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.

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 one unopened gallon or container for each paint type, color, composition, grade, finish, and variety.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products manufactured by one of the following, or equal.
   1. Vista Paint.

2. Dunn Edwards.
3. Benjamin Moore.

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 or selected by the Architect.
   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)

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
   3. Protect work areas from dust and other airborne contaminants during surface preparation and paint installation. Protect adjacent surfaces against soiling and damage. Close and protect drains and other openings and penetrations to prevent paint intrusion or migration of liquids.
   4. 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.
   5. Install paint using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   6. Only install paint under conditions that ensure finishes are free from blemishes and defects.

7. Provide smooth surfaces of uniform finish, color, appearance, and coverage. Paint surfaces with cloudiness, spotting, holidays, runs, or other imperfections are prohibited and are rejected as non-conforming work.
8. Do not exceed the application rates recommended by the manufacturer.
9. Completed work must match approved samples and mockups, as accepted by the Architect.
10. 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. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work. Replace soiled paint that cannot be cleaned to the same condition as new.

C. Protection:
1. Protect installed equipment in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SUBSTRATE	NO. OF COATS	VISTA PAINT	DUNN-EDWARDS	BENJAMIN MOORE
E X T E R I O R S U R F A C E S - L O W V O C				
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 96 23 – GRAFFITI-RESISTANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Penetrating graffiti-resistant coatings,
   2. Non-porous surface graffiti-resistant coatings,
   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 SECTION REQUIREMENTS

A. Performance Requirements:
   1. When compared visually to an untreated sample under the same lighting conditions, graffiti-resistant coatings 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. Coatings must remove 100 percent of all types of paint and graffiti materials from treated surfaces without damaging the coating or the substrate; no evidence of graffiti may remain upon graffiti removal.
   3. Coatings must not show any signs of deterioration or change of appearance during the warranty period after graffiti removal; ghosting, staining, or shadowing is prohibited.
   4. Coatings must withstand at least 120 cleaning cycles over the same area without measurable coating deterioration.
   5. Coatings must not increase substrate dirt pick-up.
   6. Coatings must not require re-application during the warranty period regardless of the number of graffiti taggings.

B. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing graffiti-resistant coatings for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing graffiti-resistant coatings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading graffiti-resistant coating installers.

C. Submittals: Submit product data, samples, and written descriptions of specified qualifications.

D. Mockups: If an *ex-situ* exterior wall integrated mockup is required for this project, then integrate graffiti-resistant coatings into the mockup as part of the work of this specification section.

E. 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.

F. 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 graffiti-resistant coating type, color, composition, grade, finish, and variety.

G. 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 PENETRATING GRAFFITI-RESISTANT COATINGS

A. Light-Duty Coatings:
   1. Description: Non-sacrificial water-based silicone emulsion graffiti protectant.
   2. Products: “Sure Klean Weather Seal Blok-Guard & Graffiti Control II” manufactured by PROSOCO, Inc., or equal.
      a. Coating: “Sure Klean Weather Seal Blok-Guard & Graffiti Control II”, or equal.
      b. Cleaner: “Defacer Eraser Graffiti Wipe”, or equal.

B. Medium-Duty Coatings:
   1. Description: Non-sacrificial water-based silicone emulsion graffiti protectant.
   2. Product: Provide the following manufactured by the Tnemec Co., or equal.
      a. Coating: “Series V626 Dur A Pell GS”, or equal.
      b. Cleaner: “Series 680 Mark A Way”, or equal.

2.2 NON-POROUS SURFACE GRAFFITI-RESISTANT COATINGS

A. Description: Non-yellowing aliphatic polyurethane permanent graffiti control system.

B. Product: “PERMASHIELD PREMIUM SYSTEM” manufactured by Monopole, Inc., or equal.
   1. Base Coat: “PERMASHIELD BASE” applied to a DFT of 2 to 3 mils per coat; apply 2 coats.
   2. Top Coat: “PERMASHIELD PREMIUM” applied to a DFT of 2 to 3 mils per coat; apply 2 coats. Do not apply thicker (may micro-blister).
   3. Cleaner: “CITRUS CLEAN SUPER” is the only cleaner manufacturer-recommended product for graffiti removal with “PERMASHIELD PREMIUM SYSTEM”.

C. Requisite Properties:
   1. Color: Clear.
   2. Specular Gloss (Sheen): Flat.

2.3 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer’s instructions and other requirements and recommendations.
   3. Install graffiti-resistant coatings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. Only install graffiti-resistant coatings under conditions that ensure finishes are free from blemishes and defects.
   5. Do not exceed the application rates recommended by the manufacturer.
   6. Installed graffiti-resistant coatings must be warrantable. Do not install, correct, or replace graffiti-resistant coatings in a manner that results in any warranty or guarantee becoming void.

B. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled graffiti-resistant coatings that cannot be cleaned to the same condition as new.

END OF SECTION

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SECTION 09 97 13 – 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.

1.2 SECTION REQUIREMENTS

A. Qualifications:
   1. Installer: Company or individuals must have at least 5 years' experience installing high-performance coatings for at least 30 previous projects similar to this project in size, material, design, and complexity.
   2. Supervisors: Individuals must have at least 7 years' experience installing high-performance coatings for at least 30 previous projects similar to this project in size, material, design, and complexity, including at least 2 years' supervisory experience directing and leading high-performance coating installers.

B. Submittals: Submit product data, samples, and written descriptions of specified qualifications.

C. 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.

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.

E. 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. 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 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: Indicated on the Drawings or selected by the Architect.
   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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. Verify in-place construction, project conditions, and the work of other specification sections conform to the manufacturer's instructions and other requirements and recommendations.
3. Install high-performance coatings using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. Only install high-performance coatings under conditions that ensure finishes are free from blemishes and defects.
5. Do not exceed the application rates recommended by the manufacturer.
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.

B. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled high-performance coatings that cannot be cleaned to the same condition as new.

C. Protection: Protect sealed concrete in place from soiling, deterioration, and damage until Substantial Completion.

END OF SECTION

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DIVISION 10

SPECIALTIES

SECTION 10 14 13 – REGULATORY SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Restroom doors signs.
   2. Egress stairway door signs.
   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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings and samples.

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.

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: 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: 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: 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 signs and adjacent items.
   3. Install signs using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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.
   5. Securely attach signs in place to supporting construction.
   6. 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. 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 and from plumb, level, and alignment.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed signs in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 14 19 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Dimensional characters used for building signage.
   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 SECTION REQUIREMENTS

A. Coordination:
   1. Coordinate placement of anchorage devices with templates for installing signage.
   2. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

B. Submittals: Submit shop drawings and samples.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Description: Provide cutout characters with square-cut, smooth, eased edges.

B. Requisite Properties:
   1. Material: Indicated on the Drawings or selected by the Architect.
   2. Typeface: Indicated on the Drawings.
   3. Thickness: At least 1/4-inch thick.
   4. Height and Depth: Indicated on the Drawings.
   5. Aluminum Finish: Furnish non-glare finish.
   6. Mounting: Projected with concealed non-corroding studs for substrates encountered.
   7. Spacing and Text/Message: Indicated on the Drawings.

2.2 MATERIALS

A. Aluminum Plate: ASTM B 209. Provide flat plate stock or extruded material Rolled stock is prohibited. Furnish alloy and temper 5005-H32 for anodic finishing; 3003-H14 for painted or unfinished material.

2.3 FINISHES

A. Comply with National Association of Architectural Metal Manufacturers publication AMP 500, "*Metal Finishes Manual for Architectural and Metal Products*" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 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 signage 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 signage material and mounting surface.

B. Tape: “VHB Tape” high-strength, double-sided, acrylic foam tape by 3M, or equal.

C. Adhesive: “732 Multi-Purpose Sealant Clear” by Dow Corning Corp., or equal.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 signage and adjacent items.
   3. 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
   4. Securely attach signage in place to supporting construction.

5. Installed signage must be warrantable. Do not install, correct, or replace signage in a manner that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install signage 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed signage in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 28 13 – 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 SECTION REQUIREMENTS

A. Submittals: Submit product data and shop drawings.

PART 2 - PRODUCTS

2.1 COMMERCIAL TOILET ACCESSORIES

A. Products: Indicated on the Drawings or selected by the Architect, 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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 toilet accessories and adjacent items.
   3. Install toilet accessories using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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.
   5. Securely attach toilet accessories in place to supporting construction.
   6. 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. 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 and from plumb, level, and alignment.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed toilet accessories in place from soiling, deterioration, and damage until Substantial Completion.
   2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 10 51 30 – SOLID PHENOLIC CORE STORAGE CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. SPC storage cabinets.
   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 SECTION REQUIREMENTS

A. Submittals: Submit product data and shop drawings.

PART 2 - PRODUCTS

2.1 SOLID PHENOLIC CORE STORAGE CABINETS

A. Description: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges.

B. Manufacturers: Provide products manufactured by Abet Laminati S.p.A., or equal.

C. Products: Indicated on the Drawings or selected by the Architect, or equal.

D. Requisite Properties:
   1. Configuration: Indicated on the Drawings.
   2. Dimensions: 4200mm by 1610mm panels at 12mm thick
   3. Color: Indicated on the Drawings.
   4. Handle: Easy-grip recessed handle.
   5. Locking: Padlock friction hasp.
   6. Accessible Storage cabinets: ADA storage cabinet modifications include added shelf 9 inches off the floor, ADA-compliant hinge that allows the door to open 180 degrees, ADA storage cabinet tag, and ADA-compliant latch and locking hardware that do not require twisting, pinching, or grasping to operate.

2.2 ACCESSORIES

A. Stainless-Steel Hooks: Provide one double-prong back hook and two single prong wall hooks at each compartment.

B. Number Plates: Manufacturer's standard engraved plates; verify numbering with Architect.

C. Locking: Provide storage cabinets with padlock hasps, key locks, or built-in combination locks, as indicated on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 storage cabinets and adjacent items.
   3. Install storage cabinets using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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.
   5. Securely attach storage cabinets in place to supporting construction.
   6. Installed storage cabinets must be warrantable. Do not install, correct, or replace storage cabinets in a manner that results in any warranty or guarantee becoming void.

B. Installation Tolerances: Install storage cabinets 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.

C. Correction and Repair:
   1. Correct deficiencies that do not conform to the Contract Documents.
   2. Repair non-conforming, damaged and defective work.
   3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
   1. Protect installed storage cabinets in place from soiling, deterioration, and damage until Substantial Completion.

2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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DIVISION 22

PLUMBING

SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.01 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

1.02 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.

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. 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).

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 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.

3OSHA - 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.

1.03 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 33 00 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 3 113 and Section 01 33 00 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 31 13.

2. Schedule and description of equipment, piping and fittings.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 77 00: 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 77 00. 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

c. 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.

d. 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.

e. Los Angeles County industrial waste permits.

f. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

g. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 31 13 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.

1.06 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.

1.07 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.

1.08 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.

1.09 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

2.01 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

3.01 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.

3.02 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.

3.03 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.

3.04 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:
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Domestic water piping	200	water

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.

3.05 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.

3.06 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.

END OF SECTION

SECTION 22 05 13 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.01 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. Section 33 11 00: Site Water Distribution Utilities.

1.02 SUBMITTALS

A. Provide in accordance with Division 01, Section 22 05 00 and specific requirements of each section of Division 22.

B. Types of welding rods to be used.

1.03 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. 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.

1.04 COORDINATION

A. Coordinate related Work in accordance with provisions of Section 01 31 13: Project Coordination.

PART 2 – PRODUCTS

2.01 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 05 00, 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.

2.02 MANUFACTURERS AND MATERIALS

A. Ball Valves: Bronze, 2-inch and smaller:

BV-1: Class 150, 600 psi, CWP, 2 piece construction reinforced Teflon seats, full port, adjustable packing gland, stainless ball and stem, threaded ends.

Hammond UP-8303A/UP-8305/UP-8513, NIBCO T-685-80-LF/TS-685-66-LF, Milwaukee UPBA400S/450S, or equal.

Provide valve Handle shall be stainless steel when valve is installed below grade or in the ground valve box.

BV-2: Class 150, 600 psi, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

NIBCO T-685-80-LF, Hammond UP-8303A, Milwaukee UPBA-400 or equal.

NIBCO T585 S6R66 (Stainless Steel), Milwaukee BA-260 (Stainless Steel).

Provide BV-1A shall be used on hot domestic and cold water systems.

BV-3 Class 150, 600 psi CWP, 2-piece construction, bronze body, reinforced Teflon seats, adjustable packing gland, (no threaded stem designs allowed), threaded ends.

Hammond UP8301A, NIBCO T-585-70, Milwaukee BA-400, or equal.

Provide BV-2 to be used only where water is NOT used for water consumption.

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. NIBCO Nib-Seal Handle.

B. Butterfly Valves:

Provide Butterfly Valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this Section.

BFV-1 Centerline Series A, 200 psi CWP tight shut-off.

1. Body: Lug type ductile iron. Suitable for bi-directional dead-end service at rated pressure without use of downstream flange.

2. Disc: Bronze, or aluminum bronze.

3. Stem: One or two-piece, 400 series stainless steel.

4. Seat and O-Rings: EPDM.

5. Upper and Lower Stem Bearings: Copper alloy or non-metallic material.

6. Operators: Valves 6 inches and smaller, with lever handle. Valves 8 inches and larger, with manual gear operator and disc position indicator.

7. Manufacturers:

a) Valves 2.5 to 6-inch: NIBCO, Milwaukee ML-233E, Hammond 6411-03, or equal.

b) Valves 8-inch and larger: Milwaukee ML 333E, Hammond 6411-03, NIBCO LD 2000, or equal.

C. Check Valves:

Provide check valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03 of this Section.

1. Bronze, 2-inch and smaller:

CHV-1: 200 psi, CWP horizontal swing, Y pattern, renewable seat and disc, threaded ends.

NIBCO T-413-Y-LF, Milwaukee UP-509, Hammond UP-904 or equal.

Provide on domestic hot and cold water systems.

CHV-2: Class 125 200 psi, swing check, bronze body, Teflon disc, soldered ends.

Stockham B-310TY, Crane 1340, NIBCO S-413-Y, Milwaukee 1509-T, Hammond IB-912 or equal.

Provide on junior fire sprinkler systems less than 3 fire sprinkler heads.

CHV-3: 200 psi, CWP, bronze body, horizontal swing, Y pattern, renewable seat and disc, solder ends.

Nibco S-413-Y-LF, Milwaukee UP 1509-T, Hammond Up-946 or equal.

Provide on domestic hot and cold water systems.

2. Cast Iron 2 1/2-inch and larger:

CHV-4: Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, threaded ends:

Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

Provide on multiple domestic hot and chilled water pump systems, multiple steam boiler return lines from steam trap.

CHV-5: Special low-pressure check valve for installation in gas lines.

Circle Seal Products Co.
119B-PP-0-15 psi; #1:1/8 inch IPS; #2:1/4 inch IPS #3:3/8 inch IPS.

Provide on low pressure gas in chemistry laboratory systems.

D. 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.

Bell and Gossett, Wheatley, Taco, Amtrol or equal.

ET-2 except for potable water system such as domestic hot water system. Provide at each domestic hot water heater or system.

E. 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. Armstrong Series CBV circuit-balancing valves, Victaulic/TA Hydronics, or equal.

Provide balancing and controlling of domestic hot water system flow for different branch circuits.

F. Gate Valves:

Provide gate valves in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.

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:

Hammond IB645, Crane 1701, Milwaukee 105, American 3F, NIBCO T-113, or equal.

Provide shut-off and isolation of equipment and device for gas system.

GV-2 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

Provide on domestic hot and cold water systems.

GV-3 Same as GV-1, except solder ends:

NIBCO S 113, Milwaukee 115, Hammond IB 647, or equal.

Provide in yard box, to each group of fixtures behind access panels, where valves are located near ceiling and beams.

GV-4 Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

NIBCO T-113-LF, Milwaukee UP 105, Hammond UP 645 or equal.

Provide on domestic hot and cold water systems.

GV-5 Class 125, 200 psi WOG, rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Stockham B-100, Crane 428, NIBCO T-111, Milwaukee 148, Hammond IB-640, or equal.

Same as GV-3 except where clearance is not an issue. Adequate clearance for operation must be provided because hand wheel and stem rise. Provide inlet and outlet connections to water heaters and pumps, make up water lines to HVAC equipment and expansion tanks.

GV-8A Class 250, 250 psi, CWP, O S and Y, IBBM, resilient seat gate valve, flanged ends.

Watts 408-OSY-RW, Kennedy 7168 or equal.

The epoxy coated valves are recommended in the domestic cold water system where corrosives in the water line might cause damage to the inside of valve and where pressure rating in excess of 200 psi is required.

GV-9 Class 125 250 psi CWP iron body, flanged ends, bolted bonnet with wheel handle, resilient wedge, non-rising stem.

Provide in walls for cold water system pipe sizes 2 ½-inch and larger.

NIBCO F-619-RW or equal.

GV-10 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.

Provide for using below grade for cold water system pipe sizes 2 ½-inch and larger.

NIBCO F-619-RW-SON or equal.

G. Globe Valves:

1. Bronze, 2-inch and smaller:

Provide in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance of Article 1.03.

GLV-1A Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Milwaukee UP 502, Hammond UP 440 or equal.

GGLV-2 Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, solder ends.

Hammond IB-418, Milwaukee 1502, NIBCO S-211-Y, or equal.

GLV-2A: Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, soldered ends.

Milwaukee UP 1502, Hammond UP 418 or equal.

Provide on domestic hot and cold water systems.

H. Piping:

PROVIDE FOR PIPES IN A DOMESTIC PLUMBING SYSTEM INTENDED TO CONVEY WATER FOR HUMAN CONSUMPTION SHALL COMPY WITH QUALITY ASSURANCE ARTICLE 1.03.

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 1S 06. American Foundry, Tyler, or AB & I or equal.

P-2 Galvanized steel, Schedule 40, ASTM A53., US Steel or equal.

P-3 Copper drainage tube, underground, type L hard, ASTM B 88, Mueller, Cerro Brass or equal.

P-4 Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306, Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-5 NOT USED

P-6 Copper water tube, Type L hard, ASTM B88. Mueller, Cambridge-Lee, Halstead or equal. (when used above ground only)

P-7 Copper water tube, Type K hard, ASTM B88, by Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-8 NOT USED

P-9 Red seamless brass 85-5-5-5, iron pipe size (IPS), threaded pipe, ASTM B43. Mueller, Cerro Brass, Cambridge-Lee, Halstead or equal.

P-10 Black steel pipe, Schedule 40, ASTM A53, Type E, ERW by US Steel, or equal.

P-11 Seamless copper tubing, tempered drawn, Type M, ASTM B88 by Mueller, Cerro Brass or equal.

P-12 NOT USED

P-13 NOT USED

P-14 NOT USED

P-15 PVC, thick wall, cast-iron OD sized, UL listed, AWWA listed, NSF listed, Class 200 with tracer wire, Blue Brute, or equal.

Provide Domestic water, irrigation and main fire line below ground only (4inch and over).

I. Pipe Fittings:

Pipe fittings in a domestic plumbing system intended to convey water for human consumption shall comply with Quality Assurance, article 1.03.C.

PF-1 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.

American Foundry, Mission, Tyler, or equal.

PF-2 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.

American Foundry, Mission, Tyler, or equal.

PROVIDE WITH P-1 AS REQUIRED BY THE ENGINEER DUE TO SITE SPECIFIC CONDITIONS.

PF-3 Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3. P-2

Stockham, Stanley Flagg, Grinnell Oreual.

PROVIDE WITH P-2.

PF-4 Cast brass drainage fittings ASA B 16.23, ASTM B 42. Provide with copper drainage tube.

Mueller Brass, Nibco, Stanley Flagg, Lee Brass Or equal.

PROVIDE WITH P-3 AND P-4.

PF-5 Wrought copper - solder type ANSI B 16.22

Mueller Brass, Nibco, Lee Brass or equal.

PROVIDE WITH P-6 PIPE, SOLDER, AND FLUX SHALL BE LEAD-FREE FOR DRINKING WATER. FLUX SHALL BE AN APPROVED WATER-SOLUBLE MATERIAL.

PF-6 NOT USED

PF-7 NOT USED

PF-8 Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

PROVIDE WITH P-9.

Mueller Brass, Lee Brass Or equal.

PF-9 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, by Stockham or equal.

PROVIDE WITH P-10.

PF-10 Cast iron, threaded, Class 125, ANSI B 16.1.

PROVIDE WITH P-12.

Stockham or equal.

PF-11 Cast-iron OD sized,, bell and spigot gasket joints.

PF-12 NOT USED

PF-13a NOT USED

PF-13b NOT USED

PF-13c NOT USED

PF-14a NOT USED

PF-14b NOT USED

PF-15 Precision cold drawn austenitic 304/304L stainless steel, with elastomer O-rings

J. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Provide for copper piping.

Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

PLA-2 PLASTIC CUSHION TO FORM AN INSULATING LINER AND ELIMINATE METAL TO METAL CONTACT WHEN SECURING COPPER TUBES AND PIPES IN AIR CONDITIONING AND REFRIGERATION INSULATION PREVENTING GALVANIC EROSION. (ACOUSTICAL TYPE FOR SOUND ABSORPTION).

Hydra-Zorb Cushion Clamps, Acousto-Clamp, or equal.

K. 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.

Marsh Keckley, Trerice, Weksler, Weiss, or equal.

L. Plug Valves:

NOT USED

M. Safety Relief Valves:

SRV-1 Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Watts 40L Cash-Acme NCLX-1

Provide for hot water system.

SRV-2 Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Watts 10 x L, Cash-Acme NCLX-1

N. 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.

1. 2-inch and smaller:
   C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley 'B', Spirax Sarco Y-type, or equal.
2. 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.

   C.M.Bailey, Armstrong, Muessco, Keckley 'A', or equal.

   Provide for Oil and gas systems.

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:

1. Steam service - 40 square mesh.

2. Other services - 16 square mesh.

Bailey No.100, Armstrong, RP&C, Keckley or equal.

Provide as same as STR-1.

STR-3 Flanged, bucket type, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations, all sizes.

Bailey No.1, Zurn 150 Series, RP&C, Keckley GFV or equal.

Provide for Domestic cold and hot water system. Mount above grade for water service.

STR-4 Grooved, T-pattern, ductile iron body, 300 psi, stainless steel frame and mesh basket, grooved ends.

Provide for Domestic hot and cold water system except for high pressure system.

O. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Stoneman Engineering and Mfg., Semco 1550

Provide for Sanitary drainage system.

P. Protective Coating for Underground Steel Piping Applied to Underground Automotive:

VV-1 Vacuum valves; for vacuum service, 125 psig

Provide for WORKING HOIST PIPING ONLY.

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.

J.M. Trantex, 3M Scotchwrap or equal.

5. 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.

6. 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.

Q. 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
Domestic hot and Cold water, underground	Up To88 inches	P-6	PF-5
Copper, underground only		P-7	PF-5
Cold water, underground (Site piping)	4-inch and over	P-144	PF-11
Domestic hot and cold water, in building and above ground	All	P-6	PF-5
In building above ground	2 to 8-inch	P-6	PF-5
Condensate drains and drains From HVAC Equip.		P-6	PF-5
Downspouts, interior above and below grade, up to 5 feet from building.		P-1	PF-1 Or PF-2
Copper Drainage Tube (Underground)	Waste and Vent	P-3	PF-4
Copper Drainage Tube (Above Ground)	Waste and Vent	P-4	PF-4
Vents	Existing Buildings and Exposed Downspouts	P-2	PF-3
Waste lines, Sanitary		P-1	PF-1 or PF-2 (IRE) if required by engineer

R. 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, 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, 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.

S. 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

3.01 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.

3.02 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.

   FOR FIRE RATED WALL PENETRATIONS FOLLOW THE UNIFORM BUILDING CODE.

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 4000 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.

REFERENCE: ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII,

UW-29 TESTS OF WELDERS AND WELDING OPERATORS.

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.

   ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, UW-51 RADIOGRAPHIC EXAMINATION OF WELDED JOINTS.

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.

2. 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.

3. 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.

4. 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.

   REFERENCE, ASME BOILER AND PRESSURE VESSEL CODE, SECTION VIII, UW-52.

5. 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.

6. 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.

2. 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.

b. Other services furnish sealant, suitable and as reviewed by the Architect.

3. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B2.1 for tapered pipe threads.

4. 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.

5. 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.

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. 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, R. W. Lyall Co., 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:

a. Steel-to-plastic (PE): Provide manufacturer's prefabricated standard transition fitting, transition from epoxy-coated steel pipe to plastic, R. W. Lyall Co., or equal.

b. Plastic-to-plastic, PVC to PE: Provide manufacturer's prefabricated standard transition fitting, transition from PVC to epoxy-coated steel pipe to PE; R.W. Lyall Co., or equal..

c. Plastic-to-plastic, PE to PE: Provide manufacturer's standard fused tapping tee assembly with shut-off feature.

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 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. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes ½ inch through 2-inch, ½ inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and ¾ inch for 8-inch and 10-inch pipe.

12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.

13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.

14. 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.

15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.

16. 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.

17. Horizontal Piping:

a. Pressure piping on roofs shall be supported from stands, trapezes, or structures so that the bottoms of pipes 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.

18. 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.

19. 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.

20. 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. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on 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 7 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. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. 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.

END OF SECTION

SECTION 22 05 53 - PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.01 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 22 05 13: Basic Plumbing Materials and Methods.

3. Section 22 10 00: Plumbing.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 22 05 00: 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

2.01 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.

2.02 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.

2.03 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.

2.04 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.

2.05 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

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

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.

2.06 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. Blue: Water, irrigation and slurry lines.

b. 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

3.01 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.

3.02 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Insulation for plumbing piping.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 22 05 00: Common Work Results for Plumbing.

3. Section 22 05 13: Basic Plumbing Materials and Methods.

4. Section 22 05 53: Plumbing Identification.

5. Section 22 10 00: Plumbing.

1.02 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.

1.03 SUBMITTALS

A. Submit in accordance with Division 01 and Section 22 05 00: 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 the 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.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 22 05 00: Common Work Results for Plumbing and Section 22 05 13: 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 05 00 and 22 05 13 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 05 00: Common Work Results for Plumbing and 22 05 13: Basic Plumbing Materials and Methods.

PART 2 – PRODUCTS

2.01 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	1.0	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

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.

2.02 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

3.01 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.

3.02 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 05 13: 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.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 22 10 00 - PLUMBING

PART 1 - GENERAL

1.01 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 92 00: Joint Sealants.

3. Section 22 05 00: Common Work Results for Plumbing.

4. Section 22 05 13: Basic Plumbing Materials and Methods.

5. Section 22 05 53: Plumbing Identification

6. Section 22 07 00: Plumbing Insulation.

7. Section 31 23 23: Excavation, Backfill for Utilities.

8. Section 33 30 00: Site Sanitary Sewer Utilities

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.

B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.03 QUALITY ASSURANCE

A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.

B. Conform to provisions of Section 22 05 00: Common Work Results for Plumbing.

C. Manufacturer of plumbing products must have ANSI/NSF Standard 61, Section 9 certification to demonstrate compliance with the federal requirements for lead contribution to drinking water, Safe Drinking Water Act SDWA and AB 1953.

1.04 PRODUCT HANDLING

A. Conform to provisions of Section 22 05 13: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.01 PIPING SYSTEMS

A. Materials: Refer to Section 22 05 13: Basic Mechanical Materials and Methods.

B. Insulation for Piping: Refer to Section 23 07 00: Plumbing Insulation.

2.02 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 equipment, 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 cast brass, chromium-plated and polished. **(No tubular traps).** 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 07 00, Basic Plumbing Materials and Methods

2. Concealed traps and 17 gage tailpieces may be rough brass finish, except as otherwise specified. Laboratory traps and tailpieces shall be as specified in Section 22 07 00: Basic Plumbing Materials and Methods. Furnish chromium-plated and polished cast brass wall flanges with setscrews and chromium-plated and polished brass casing on discharge side of each trap.

3. Tailpieces shall be not lighter than 17 gage, brass, chromium-plated, and polished. Furnish and install chromium brass plated wall flanges with set screws and chromium-plated 20 gage brass casing on discharge side of each chrome-plated all cast trap.

D. Faucet and Shower 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.

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. Exposed supplies for showers shall be chromium-plated brass pipe up to header with hospital threads or shall be furnished with fittings and valves, which completely cover threads.

3. Supplies to water closet tanks, lavatories, and drinking fountains shall be furnished with chromium-plated and polished screwed type angle compression stops with square shank stems and lock shields extending beyond stem. Instead of solid supply piping, polished chrome-plated risers of 3/8 inch outside diameter with ferrule stop end and metal nosepiece may be furnished. The installation of braided stainless or easy hooker's supplies is not permitted. Exception: Supplies that rise vertically from floor shall be furnished with straight type instead of angle type stops.

4. Each supply or pipe that penetrates a finished surface and plumbing pipes passing through a countertop or part of a cabinet shall be furnished with a chromium-plated brass flange except flanges furnished by manufacturer of flush valves as an assembly.

5. Water supplies of plumbing fixtures shall be protected against back-siphonage in event of a vacuum in piping system.

6. Discharge outlets of supply faucets for lavatories and sinks shall clear top of overflow rim by at least one inch.

7. Toilet and urinal flush valves shall be furnished with recognized atmospheric vacuum breakers, installed a minimum of 6 inches above fixture.

2.03 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. Provide for painted and stucco walls.

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. Provide for painted walls, screwed into cleanout plug.

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. Provide for tile walls.

SMITH	ZURN	WADE	WATTS	MIFAB	JOSAM	OR EQUAL
4735U	Z-1460-VP	58630	CO-300-S-6	C1400-S-3-6	58640-VP	

2.04 BACKFLOW PREVENTION ASSEMBLIES

A. Schedule Numbers: See fixture schedules on plans.

2.05 BACKWATER SEWER VALVE ASSEMBLY

A. Schedule Numbers: Not used.

2.06 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. Provide 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 Provide for finished floors inside buildings, in covered areas, and in concrete paving.

Square:

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL

4053L-U-NB	ZN-1400-T	CO-200-S	C1220-S-1-6l	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. Provide for areas outside building on concrete paving.)

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. Provide for above grade, outside building at base of exposed downspout.

SMITH	ZURN	WATTS	MIFAB	JOSAM	OR EQUAL
4512	Z-1445-BP	CO-460-34A	C1460	58910	

CO-5: Raised threaded head brass plug. Provide for yard box YB-3.

ZURN	WAATS	SMITH	JOSAM	OR EQUAL
Z-1470-A	CO-590	4285	58540-20	

2.07 CIRCULATING PUMPS, HOT WATER HEATING SYSTEM

A. Schedule Numbers: See equipment schedules on plans.

2.08 DRINKING FOUNTAINS

A. Drinking Fountains shall be provided with brass free waterways and lead mitigating water filtering systems (DFWF).

C. Schedule Numbers: See fixture schedules on plans.

2.09 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: Not used.

2.11 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.

B. Schedule Numbers: See fixture Schedules on plans.

2.12 FLOOR DRAINS

A. Schedule Numbers: See fixture schedules on plans.

2.13 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.

2.14 FLUSH VALVE ASSEMBLY

A. Schedule Numbers: See fixture schedules on plans.

Valves shall be furnished so that flush will remain constant and 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 pounds pressure and will operate noiselessly.

4. Tailpiece shall be not 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.

2.15 FLOOR SINKS

A. Schedule Numbers: See fixture schedules on plans.

2.16 HOSE BIBBS

A. Schedule Numbers: See fixture Schedules on plans.

2.17 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: See fixture schedules on plans.

2.18 PIPE HANGERS

A. Refer to Section 22 0513: Basic Plumbing Materials and Methods.

B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etcetera.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUAL

2.19 P-TRAPS

A. Schedule Numbers:

PT-1: Cast brass complete, chrome-plated.

ZURN	AB&A	KOHLER	OR EQUAL
Z-8712-LC	107	K-9018	

2.20 ROOF DRAINS

A. Schedule Numbers: Not used.

2.21 SERVICE SINKS and TRIM

A. Schedule Numbers: See fixture schedules on plans.

2.22 SERVICE STOP GAS VALVES

NOT USED

2.23 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,	CRANE	NIBCO	OR EQUAL
442-LKABCP	8.5113.	77	

STV-2: Partition:

CHICAGO	T& S BRASS	OR EQUAL
1771-ABCP	B-1028	

STV-3: Straight Type, with Loose Key:

CHICAGO	CRANE	T&S BRASS	OR EQUAL
45-LKABCP (1/2 inch)	8-5111	B-O418	

2.24 THERMOSTATIC MIXING VALVE ASSEMBLIES (TMVA)

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

B. Manufacturers: See equipment schedules on plans.

2.25 TRAP PRIMERS

A. Schedule Numbers: See fixture schedules on plans.

2.26 URINALS

A. Schedule Numbers: See fixture schedules on plans.

2.27 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: See fixture schedules on plans.

2.28 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	

2.29 WATER HEATERS / Domestic / Boilers

A. Gas fired water heaters shall meet the Flammable Vapors Ignition Resistance requirements (FVIR).

B. Gas and 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. Instantaneous/Tank-less water heaters of any kind are prohibited. A minimum 6 gallon water heater is to be used.

E. Schedule Numbers: See equipment schedules on plans.

2.30 WATER HAMMER ARRESTORS

WHA- See fixture schedules on plans.

2.31 YARD BOXES

A. Schedule Numbers:

YB-1 Yard Boxes: 14 ¾-inch by 20-inch by 12-inch, cast concrete, with cast iron traffic cover marked "WATER"

Provide for use over gas stops.

BROOKS 36-H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

YB-2: Same as YB-1, marked "SEWER"

BROOKS 36- H MB with No. 36-T Cast iron Cover	EISEL 363.5	OR EQUAL

2.32 FIXTURE CONNECTIONS

A. Branches to individual fixtures shall be of the following sizes unless larger sizes are indicated on Drawings:

	Copper,	Copper,	Trap and	Soil/	
Fixture	Cold	Hot	Connections	Waste	Vent
WC Flush Valve	1 inch	-----	4-inch	4-inch	2-inch
Lavatories	½ inch	½ inch	1 ½-inch by 1 ¼-inch	2-inch	1 ½-inch
Sinks:					
Service	½ inch	½ inch	2-inch	2-inch	1 ½-inch
Drinking Fountains:					
Single	3/8 inch	-----	1 ½-inch	2-inch	1 ½-inch

Fixture	Water Supply	Soil/ Horizontal	Vent
Urinals, Wall-Hung Flush Valve			
Standard	¾ inch	2-inch	1 ½-inch
Access Compliant Use	1 inch	2-inch	1 ½-inch
Sill cocks	¾ inch minimum	-----	-----

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.

2.33 HEIGHT OF FIXTURES

A. Heights for standard fixtures.

Fixture	Adult and High School	Middle	Elem.	Kindergarten and Younger
Water Closets	15-inch	15-inch	15-inch	10-inch
Lavatories	32-inch	32-inch	30-inch	25-inch
Drinking Fountains	42-inch	40-inch	32-inch	30-inch
Urinals, lip height	24-inch	21-inch	18-inch	N/A

B. Heights for access compliant fixtures.

Fixture	Adult	Elementary	Kindergarten and Younger
Toilets, center line from wall	18-inch	15-inch	12-inch
Toilets, height to top of seat	17 to 19 inches	15-inch	10-inch-12-inch
Lavatories, sink top height	34-inch maximum	29-inch maximum	24-inch maximum
Lavatories, sink knee clearance	27-inch minimum	24-inch minimum	19-inch minimum
Urinals, lip height	17-inch maximum	15-inch maximum	N/A
Urinals, flush handle height	N/A	N/A	N/A
Drinking fountains, bubbler height.	36-inch maximum	32-inch maximum	30-inch maximum
Drinking fountains, knee clearance	27-inch minimum	24-inch minimum	22-inch minimum
Wash Sink	Per Drawings		

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 05 13: 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 materials for trap arms shall be Brass, Cast Iron or DWV copper

8. 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.

9. 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 over flow. (Install above upper terminal water closet where there are more than one water closet 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 23 23: 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 size shall be per UPC (3/4 inch up to 3 ton only). 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 07 00: 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 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 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.

3.10 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.

B. 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.

C. Method:

1. A Reduced Pressure Backflow assembly shall be in 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. System is to be flushed to remove any materials that may have entered the system.

3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.

D. 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.

E. 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, warning sign or tags shall be removed.

3.11 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.

3.12 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.

3.13 UNDERGROUND PIPE MARKERS

A. Pipe markers shall be furnished according to Section 22 05 53: "Plumbing Identification"

B. Under ground 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. Blue – with the words: CAUTION WATER LINE BELOW

3.14 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.

3.15 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.

3.16 COMPRESSED AIR SYSTEMS

NOT USED

3.17 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.

3.18 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.

3.19 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.20 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.01 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.

1.02 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.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 33 00: 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 31 13: Project Coordination and Section 01 33 00 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 31 13 and Section 01 33 00 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 31 13.

2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 77 00: 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.

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 77 00. 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 23 05 93.

f. Los Angeles County industrial waste permits.

g. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

h. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 23. Contractor shall coordinate work in accordance with Section 01 31 13 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.

1.06 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.

1.07 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.

1.08 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

2.01 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

3.01 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.

3.02 LOCATION OF EQUIPMENT

A. Location of 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. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.03 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 23 05 93: Testing, Adjusting, and Balancing for HVAC.

2. 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. 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.

E. 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 the 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.

3.04 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.

3.05 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 50 00: 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. 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. Refrigerant piping shall be cleaned as specified.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section specifies the requirements for test and balance of HVAC and related systems.

B. RELATED REQUIREMENTS

1. Section 01 11 00: Summary of Work.

2. Section 01 31 13: Project Coordination.

3. Section 01 32 13: Construction Schedule.

4. Section 01 33 00: Submittal Procedures.

5. Section 01 77 00: Contract Closeout.

6. Section 23 05 00: Common Work Results for HVAC.

7. Section 23 09 00: HVAC Instrumentation and Controls.

8. Section 23 30 00: Air Distribution.

9. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION

3.01 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

3.02 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.

3.03 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 completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

B. 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.

C. 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.

D. 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.

3.04 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. 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

3.05 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Exhaust Fans.

2. All associated Air Terminal Devices, i.e. grilles

3. Exhaust Duct Systems.

3.06 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.

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. Fan design airflow and service.

7. Fan static pressure, suction/discharge, static profile, and static control point.

8. SCFM Air Flow Measurement vs. Design CFM.

3.07 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.

3.08 FIELD EXAMINATION

A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:

1. Over-voltage and current protection have been provided for motors.

2. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required.

3. Operations and maintenance manuals have been supplied.

3.09 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 full 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. 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.

c. 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 information shall be recorded on air outlet data sheets.

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 and other safety devices.

END OF SECTION

SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 – GENERAL

1.01 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. Furnishing record drawings and operational data of systems as installed and finally adjusted.

2. Formal instruction of Owner personnel in operation of equipment.

B. Following items are specified in other Sections:

1. Load carrying wiring for above listed devices and wiring for starting switches not interconnected with temperature control system. (Division 26: Electrical).

2. Electrical power to control panels and other equipment. (Division 26: Electrical).

C. Related Requirements:

1. Division 01: General Requirements.

2. Division 26: Electrical.

3. Section 23 05 00: Common Work Results for HVAC.

4. Section 23 30 00: Air Distribution.

5. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 05 00: 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. Operating Instructions: Comply with provisions of Section 23 05 00: Common Work Results for HVAC. Explain and demonstrate operation of system to Owner representatives as required.

D. Guarantee: Refer to Section 23 05 00: Common Work Results for HVAC.

1.03 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Comply with provisions stated under Section 23 05 00: Common Work Results for HVAC.

1.04 PRODUCT HANDLING

A. Production, Replacement, Delivery and Storage: Refer to Section 23 05 00: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 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 shall be provided with 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. 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.

C. 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.

PART 3 – EXECUTION

3.01 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.

3.02 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Provide 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 23 05 00: Common Work Results for HVAC.

3. Section 23 05 93: Testing, Adjusting and Balancing for HVAC

4. Section 23 09 00: HVAC Instrumentation and Controls.

5. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 05 00: 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.

1.03 QUALITY ASSURANCE

A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 23 0500: 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.

1.04 PRODUCT HANDLING

A. Protection, Replacements, Delivery and Storage: Comply with provisions stated in Section 23 05 00: Common Work Results for HVAC.

1.05 COORDINATION

A. Coordinate activities in accordance with provisions of Section 23 05 00: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

A. Unless otherwise noted, provisions, including amendments thereto, 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 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 concealed ductwork shall conform to requirements in HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC unless noted otherwise on the drawings. The more stringent requirements shall prevail. Galvanized steel ducts gage thickness and permissible joints and seams of exposed ductwork shall conform to requirements in Tables 2 and 3, Minimum Metal Gages, of this Section. When more stringent requirements are noted on the drawings the most stringent requirement 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 SMACNA 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 for concealed flat oval duct construction shall conform to requirements in HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC. The more stringent requirements shall

prevail. Gage thickness and permissible joints and seams of exposed ductwork shall conform to requirements in Table 1, of this Section.

5. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.

I. Aluminum Ducts:

1. Material for aluminum duct shall be of 3003-H14 alloy aluminum sheets, with such designation embossed or stenciled on each sheet. Minimum tensile strength shall be 19,000 psi.

2. Aluminum duct gage thickness and permissible joint and seams shall conform to Table 1, Construction Details for Rectangular ducts, in this Section.

3. Aluminum ductwork shall be furnished to transport moisture-laden air from shower rooms, shower drying rooms, dishwashers and discharge ducts from evaporative condenser and cooling towers.

4. Unless otherwise noted, follow construction details for steel construction standards as indicated for unreinforced duct, reinforced duct, or cross-broken duct.

5. Button punch snap-lock seams on aluminum ducts are not permitted.

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 or tape 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.

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.

2.02 DAMPERS

A. Manually Operated Volume Control Dampers:

1. VD-1, 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.

2.03 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. Grilles or registers mounted on painted walls shall be furnished with a baked prime coat and finish, painted to match with wall paint color.

4. Grilles indicated or scheduled on the drawings to comply with special requirements shall take precedence over the standard items specified.

B. Grilles – Exhaust on exposed ceiling:

1. GR-1 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.

C. Grilles – Exhaust on Wall:

1. WR-1: Sidewall exhaust 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.

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 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. If the indicated duct is to be furnished with an acoustic lining, add twice the thickness of the acoustic liner in both the duct width and height dimensions to provide the gross sheet metal duct 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.

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. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.03 DUCT CONSTRUCTION

A. Minimum ductwork gages, joints, reinforcing, and bracing of concealed ductwork shall conform to SMACNA and CMC. Exposed ductwork shall conform to the following tables in addition to SMACNA and CMC. The most stringent standards shall prevail. Hoods, plenums, and castings shall not be lighter than the duct gage listed in Table 2 for corresponding dimensions. Additional bracing shall be provided to prevent objectionable panel vibration.

B. Provide longitudinal seams of the grooved snap lock and standing, sealed and taped, or sealed spiral or continuously welded. For exhaust duct, taping may be omitted.

TABLE 1 - SHEET METAL THICKNESS FOR CIRCULAR DUCTS AND FLAT-OVAL (FOR STATIC PRESSURES LISTED)

Gage Thickness

2-inch Water Column	Diameter of Duct	Horizontal Girth	
Maximum S.P.	Maximum	Maximum	Joints
Round / Oval	Diameter Support	Distance	
26 / 24	Up to 9 inch	10-foot	2-inch slip
26 / 24	9 to 14-inch	8-foot	4-inch
24 / 22	14 to 23 inch	8-foot	4-inch
22 / 20	23 to 37-inch	8-foot	4-inch
20 / 18	37 to– 51-inch	6-foot	1 ¼-inch by 1 1/8-inch flange

C. Construction Details for Rectangular Sheet Metal Ducts for Low-Pressure Systems - Velocities not Exceeding 2,000 Feet Per Minute:

1. For pressures in excess of 2 inches water column, duct wall thickness shall be 2 gages heavier than set forth in this table.

2. Duct specifications shown below are applicable when ducts larger than 18 inches are cross-broken. Where cross breaking is not provided, duct wall thickness shall be 2 gages heavier on ducts 19 inches to 60 inches wide unless longitudinal standing seams are furnished.

TABLE 2 - MINIMUM METAL GAGES - UNREINFORCED RECTANGULAR DUCT
(2" W.G. OR LESS)

Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints	Horizontal Support Maximum Distance
26 / 24	Up to 10-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
24 / 22	11 to 12-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
22 / 20	13 to 14-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
20 / 18	15 to 18-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
18 / NA	19 to 20-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot
16 / NA	21 to 24-inch	Drive-slip, plain S-slip, or 1 inch government lock	10-foot

TABLE 3 - MINIMUM METAL GAGES - REINFORCED RECTANGULAR DUCT
(2" W.G. OR LESS)

Reinforcement Ratings To Comply with SMACNA Standards

Minimum Gage Thickness Steel / Aluminum	Max. Side, Gross Dimensions	Duct Permissible Girth Joints	Reinforcement Spacing Max. Distance
26 / 24	Up to 14-inch	Drive-slip, plain S-slip, or 1 inch government lock with B rated reinforcement	6’
24 / 22	13 to 18-inch	Drive-slip, plain S-slip, with C rated reinforcement	8’
	19 to 30-inch	Standing S/D -slip, 1 inch bar slip, or 1 inch government lock with E rated reinforcement	5’

* Button punch snap-lock seams, using Lockformer 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.

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.

3.04 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 be thick double-wall vane type, Ductmate Industries PROrail, or equal. Duro Dyne vane rail system duct turns may be furnished, provided they are of thick double wall type and Shop Drawings are submitted and reviewed by the Architect. Duct turning vanes shall be of same material as ductwork and shall be rigidly fastened in ductwork.

3.05 DUCT JOINTS AND SEAMS

A. Ducts shall be furnished with joints and seams sealed by using sealant, taping, soldering, or welding.

B. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

C. Seams around fan, coil housing and plenums shall be sealed with gaskets or sealing compound to provide an airtight assembly.

D. 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.

3.06 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.

3.07 AIR TERMINAL DEVICES

A. Grilles:

1. Install wall exhaust grilles a minimum of 6 inches below roof unless otherwise indicated.

2. Fasten wall mounted grilles to flanges of duct collars.

3.08 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.

3.09 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 closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls 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.

C. Pack space between sleeve or opening and duct with commercial grade packing yarn.

3.10 DUCT HANGERS AND SUPPORTS

A. Exposed or easily accessible ductwork: Single horizontal ducts shall be suspended from heavy steel hanger straps securely fastened to overhead structural members. Ducts shall be supported by a hanger strap passing around and fastened to duct with not less than two Parker No. 10 screws set approximately 2 inches in from each edge, to form a supporting stirrup attached to overhead supports. Rectangular ducts shall be provided with two hanger straps, one located on each side of duct. Round ducts may be installed from a single hanger strap unless conditions require that duct be held tight against ceiling, in which case two hanger straps may be brought down each side of duct, oriented at right angles to axis of duct and securely fastened to duct standing leg seam or angle iron stiffener with a minimum of two bolts, measuring 1/4 inch, for each side of duct. Hanger straps shall be galvanized with a minimum size of 1 1/8-inch by 14 gage. Angles of galvanized steel of 1 1/8-inch by 1 1/8-inch by 16 gage (14 gage for ducts 60 inches or greater) may be furnished instead of straps.

B. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.

3.11 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.12 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 23 80 00 - HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fans.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 23 05 00: Common Work Results for HVAC.

3. Section 23 09 00: HVAC Instrumentation and Controls.

4. Section 23 30 00: Air Distribution.

1.02 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.

1.03 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 05 00: 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.

1.04 QUALITY ASSURANCE

A. Provide submittals in accordance with Section 23 05 00: Common Work Results for HVAC.

1.05 PROJECT RECORD DOCUMENTS

A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 05 00: Common Work Results for HVAC.

1.06 WARRANTY

A. Manufacturer shall warrant parts for a period of two years.

PART 2 – PRODUCTS

2.01 WIND ASSISTED ROOF VENTILATORS

A hybrid roof ventilator that combines natural ventilation with a high efficiency electric motor in a single unit, designed to allow the ventilator to operate in natural mode driven by prevailing winds/stack action or power mode when prevailing winds are stagnant. The design shall have no throat mounted fan to impede airflow. The hybrid ventilator shall be provided with an electronic commutating motor directly connected between the stator and turbine, so that the airflow under natural power is not impeded. The noise level @ 10ft must be less than 46 dB(A) and specific flow rate 27.1cfm/W or better.

Manufacturer – Edmonds, Invisco Industrial or equal

PART 3 – EXECUTION

3.01 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.

3.02 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 and Engineer.

C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers.

1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.

3.03 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 05 00: 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 05 00: 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 05 00: Common Work Results for HVAC.

E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 05 00: Common Work Results for HVAC.

3.04 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.05 PROTECTION

A. Protect Work of this Section until Substantial Completion.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.

B. Related Requirements (As Applicable)

1. Division 01 - General Requirements.

2. Section 03 3000 - Cast-in-Place Concrete.

3. Section 09 9000 - Painting and Coating.

4. Division 14 - Conveying Equipment.

5. Division 23 - HVAC.

6. Division 27 – Communications.

7. Division 28 - Electronic Safety and Security.

8. Section 31 2323 - Excavation and Fill for Utilities.

C. Applicable Standards(Current Editions)

1. ASTM D 709 – Laminated Thermosetting materials.

2. ANSI/NEMA FB-1– Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

3. ANSI/NEMA 250– Enclosure for Electrical Equipment (1000 Volts Maximum).

4. California Electrical Code (CEC).

5. IEEE C57.12.28– Standard for Pad-Mounted equipment (Enclosure Integrity).

6. UL 1– Standard for Flexible Metal Conduit.

7. UL 1242 – Standard for Electrical Intermediate Metal Conduit.

8. UL 506– Specialty Transformers.

9. UL 6 – Electrical Rigid Metal Conduit-Steel.

10. UL 797 – Electrical Metallic Tubing-Steel.

11. UL 870– Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 BASIC ELECTRICAL REQUIREMENTS

A. Quality Assurance:

1. Workers possessing the skills and experience obtained in performing work of similar scope and complexity shall perform the Work of this Division.

2. Refer to other sections of the Specifications for other qualification requirements.

B. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Drawings are essentially diagrammatic and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.

2. Verify final locations for rough-ins with field measurements and with the requirements of the equipment to be connected.

3. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduit. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.

4. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.

5. Outlet locations shall be coordinated with architectural elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity.

6. Coordinate electrical equipment and materials installation with building components and the Work of other trades

7. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

8. Coordinate connection of electrical systems with existing underground utilities and services.

C. Terminology:

1. Signal Systems: Applies to clock, bell, fire alarm, annunciator, sound, public address, buzzer, telephone, television, inter-communication, elevator access controls, lighting control systems and security systems.

2. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts. Medium voltage: Applies to power systems operating at more than 600 volts.

3. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.

D. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.

E. Structural Considerations for Conduit Routing:

1. Where conduits pass through or interfere with any structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, conform to CBC, Part 2, Title 24, Section 1906.3 for conduits and pipes embedded in concrete and Sections 2308.9.10 and 2308.9.11 for notches and bored holes in wood; for steel, as detailed on the structural steel Shop Drawings.

2. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, encasement shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, if any, or shall be doweled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.

3. Holes required for conduit entrances into speaker poles, floodlight poles or other poles, shall be drilled with the conduit nipple or coupling welded to poles. Welds shall be provided by the electric arc process and shall be continuous around nipple or coupling.

F. Electrically Operated Equipment and Appliances:

1. Furnished Equipment and Appliances:

a. Work shall include furnishing and installing wiring enclosures for, and the complete connection of electrically operated equipment and appliances and electrical control devices which are specified to be furnished and installed in this or other sections of the Specifications, wiring enclosures shall be concealed except where exposed Work is indicated on the Drawings.

b. Connections shall be provided as necessary to install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets are of incorrect electrical characteristics or any specified

equipment fails to operate properly, repair and/or replace the outlet and/or equipment.

2. Equipment and Appliances Furnished by Others:

a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the Owner," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.

b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for control systems, furnished under different Divisions of the Specifications. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.

d. Mechanical, plumbing and auquatics equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.

e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

G. Protection of Materials: Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.

H. Cleaning:

1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.

2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.

3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

I. WARRANTIES

1. Provide one year warranty on all material and labor performed, unless noted otherwise in specific sections.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Advise the Inspector before starting the Work of this Division.

B. Exposed conduits shall be painted to match the surfaces adjacent to installation.

C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.

D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the Inspector. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to public.

E. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches edge to edge from new or existing holes, unless otherwise required by the Architect. All coring to be laid out and reviewed by Architect prior to drilling. Contractor to verify location of structural steel, rebar, stress cabling or similar prior to lay out.

F. Electrical equipment shall be braced and anchored for CBC Seismic Design requirements, or as otherwise indicated on the Drawings.

3.2 DELIVERY STORAGE AND HANDLING

A. Deliver products to project site with proper identification, which shall include names, model numbers, types, grades, compliance labels, and similar information needed for District identification; all products and materials shall be adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion.

3.3 CUTTING AND PATCHING

A. Cutting and patching of electrical equipment, components, and materials shall include the removal and legal disposal of selected materials, components, and equipment.

B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

C. Repair or restore other work, or surfaces damaged as a result of the work performed under this contract.

3.4 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

B. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the Owner Authorized Representative.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 26 05 13 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Boxes, enclosures, keys and locks.

2. Receptacles and switches.

3. Identifications and signs.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Division 26 – Electrical.

PART 2 - PRODUCTS

2.1 BOXES, ENCLOSURES, KEYS AND LOCKS

A. Outlet Boxes and Fittings:

1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.

2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting.

3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.

4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting installed.

5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2 1/8-inch deep or larger, depending upon number of conductors or conduits therein. Plaster rings shall be furnished with round opening with two ears drilled 2 23/32 inches center to center.

6. For local device outlets provide 4-inch square 2 1/8-inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than two switches.

7. Plaster rings shall be provided on flush-mounted outlet boxes except where otherwise indicated or specified. Plaster rings shall be same depth as finished surface. Install approved ring extension to obtain depth to finish surface.

8. Factory made knockout seals shall be installed to seal box knockouts, which are not intact.

9. Where flexible conduit is extended from flush outlet boxes, provide and install weatherproof universal box extension adapters.

B. Junction and Pull boxes:

1. Junction and pull boxes, in addition to those indicated, shall only be used in compliance with codes, recognized standards, and Contract Documents.

2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsion and deflecting forces. Boxes shall be furnished with auxiliary angle iron framing where necessary to ensure rigidity.

3. Covers shall be fastened to box with a sufficient number of machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb. Surfaces of pull and junction boxes and covers shall be labeled in black marker ink designating system, panelboard and circuit designation contained in box. In exposed Work, designation shall be installed on inside of pullbox or junction box cover.

4. Weatherproof NEMA 3R pull and junction boxes shall conform to foregoing for interior boxes with following modifications:

   a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented to, and trimmed even with, cover all around.

   b. Surface or semi-flush mounting pull and junction boxes shall be UL, or another Nationally Recognized Testing Laboratory (NRTL) listed as rain-tight and shall be furnished complete with threaded conduit hubs.

   c. Exposed portions of boxes shall be galvanized and finished with one prime coat and one coat of baked-on gray enamel, unless already furnished with factory baked-on finish.

5. Junction and pull boxes shall be rigidly fastened to structure and shall not depend on conduits for support.

6. Underground Concrete Pull Boxes:

a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet by 3 feet by 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inch by 10 inch in each 3 feet side, and one 20 inch by 20 inch knockout in each 2-foot side.. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one inch diameter ground rod knockout. In pull boxes, furnish and install cable racks on walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. Pull boxes shall be furnished with 3/4 inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate bolted to frame. Covers shall be marked as electrical, power, or signal as required. Pull boxes shall be as manufactured by Oldcastle Precast, Jensen Precast, Kistner, Western Precast, or equal.

b. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing provided with a grounding terminal.

c. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.

d. Remove floor drain knockout and provide a depth of 24 inches of crushed rock below box extending a minimum of 12 inches beyond on all sides.

e. Permanently and effectively ground metal equipment cases, cable racks, and similar items in pull boxes to site grounding electrode system. Provide grounding conductor in compliance with CEC Article 250.

f. Provide 6-inch deep sand base under pull boxes.

g. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord.

h. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry locations, when tested for any shoe sole material. Test shall comply with ASTM D 1047 or F 489 or F 609 standards. Submit manufacturer's test results for Architect's review as part of materials and equipment submittals.

i. The use of underground extension boxes shall be limited to not more than 1 times the original depth of pull box.

7. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Oldcastle,Jensen, Kistner, Western Precast, or equal.

8. Manholes, vaults, and pull boxes required by a utility company, and installed as part of this Contract, shall meet requirements of servicing utility company.

C. Keys and Locks:

1. Provide two keys with furnished door locks, including cabinet door locks and switchboard locks, two keys for lock switches on switchboards or control panels, and two keys with interlocks or other furnished lock switches. Deliver keys to OAR.

2. Locks shall be keyed to County of LA standard keys for access to operate equipment. Coordinate with the County OAR. Special keys and locks shall only be provided where specified.

2.2 RECEPTACLES AND SWITCHES

A. Receptacles:

1. Duplex receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wired with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts.

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20	PS5362-I	HBL5362-I	5362-I
(15 amps) NEMA 5-15	PS5262-I	HBL5262-I	5262-I

2. Duplex receptacles on circuits supplied by panel boards with integral surge suppression shall be Pass & Seymour model number PS5262BL (blue), Hubbell DRUBTVSS15, Leviton 5262-SBU, 15 amps, 120 volts, or equal.

3. Single receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wire with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be thermoplastic. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be same as circuit breaker or fuse.

NEMA #	Pass & Seymour	Hubbell	Leviton
(20 amps) NEMA 5-20R	5361-I	HBL5361-I	5361-I
(15 amps) NEMA 5-15R	5261-I	HBL5261-I	5261-I

4. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with 2010 UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body and shall be ivory. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure.

NEMA #	Pass & Seymour	Hubbell	Leviton

NEMA 5-20R	2095-I	GFR5352-IA	7899-I
NEMA 5-15R	1595-I	GFR5252-IA	8598-I

5. Provide weatherproof receptacles, except where otherwise indicated or specified, consisting of GFCI receptacles, as specified herein, and metal plates with die-cast lockable hinged lids and weatherproof mats;

6. Receptacles within 6 feet of water fountains, counter tops, or any sources of water shall be GFCI type.

B. Switches:

1. Local Switches:

a. Provide local switches, high strength thermoplastic toggle, specification industrial grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double pole, 3-way, 4-way, non-lock type. Provide non-lock type switches with ivory handles;

	Pass & Seymour	Hubbell	Leviton
Single pole	PS20AC1I	HBL1221I	1221-2I
Double pole	PS20AC2I	HBL1222I	1222-2I
Three way	PS20AC3I	HBL1223I	1223-2I
Four way	PS20AC4I	HBL1224I	1224-2I

b. Provide lock type switches, specification industrial grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by same key. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16-inch long forks, 5/32-inch spacing between forks and 5/16-inch width overall.

	Pass & Seymour	Arrow Hart
Single pole	PS20AC1L w/#500 Key-2L	1221L w/1201LK Key
Double pole	PS20AC2Lw/#500 Key	1222L w/1201LK Key
Three way	PS20AC3L w/#500 Key	1223L w/1201LK Key
Four Way	PS20AC4L w/#500 Key	1224L w/1201LK Key

c. Pilot light switches shall be rated 20 amps and shall conform to specifications for local switches. Switches shall be furnished with red, Lexan handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Pilot light 120 volt switches

	Pass& Seymour	Hubbell	Leviton
Single pole	PS20AC1-RPL	HBL1221-PL	1221-PLR
Double pole	PS20AC2-RPL	HBL1222-PL	1222-PLR
Three way	PS20AC3-RPL	HBL1223-PL	1223-PLR

Same as above except rated at 20 amps at 277 volts.

	Pass & Seymour	Leviton	Hubbell
Single pole	PS20AC1-RPL	1221-7PR	HBL1221-PL7

d. Provide remote control switches for mechanically held contactors arranged for 3-wire control, toggle type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles

Pass & Seymour	Hubbell	Leviton
1251-I	HBL1557-I	1285-I

e. Provide remote control switches for magnetically held contactors arranged for 3-wire control, toggle type, maintained contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclosed mechanism, and ivory handles.

Pass and Seymour	Hubbell	Leviton
1225-I	HBL 1385	1285-I

f. Momentary Contact locking key type switch. 20A 120/277V center off. Key shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/32" spacing between forks and 5/16" width overall.

Arrow Hart

AH1995L w/ AH2000 key

g. Momentary Contact switch low voltage 1 pole 3A 24VAC 3 position center off. Key for locking switch shall be District standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/31" spacing between forks and 5/16" width overall.

Pass and Seymour

Toggle 1081I
Locking 1081KGRY w/#500 Key

2. Time Switches and Photoelectric Controls for existing construction:

a. Provide time switches with a 7-day, solid-state, electronic type capable of fully automatic or manual operation and housed in a sheet steel enclosure unless built into a panel or switch¬board. Contacts rated for 25 amps resistive or inductive, each pole 240 VAC; 5 amps tungsten or 277 VAC pilot duty, each pole 240 VAC. Time switches to contain a non-volatile clock and non-volatile memory with a built-in rechargeable super capacitor power carry-over system. Battery carryover is not acceptable. Provide a minimum of 15 on/off set points per week. Timing to be in one minute increments with a minimum on or off time of one minute. Time switch digital displays to indicate days of week, hours, and minutes. Display to contain a load status light to indicate when equipment is in operation. Time switches; Paragon Model EC7000 Series, Tork Model EW 101B series, Intermatic ET7000 series, or equal. Features required for application:.

1) Liquid crystal display panel.

2) Holiday scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.

3) Automatically adjusts to and from daylight savings time and for leap year.

4) Contact ratings: 10 amp at 240 VAC.

5) Safety override switch for each circuit to either provide shut down of circuit or to override on.

6) Selective review: All or part of schedule shall be displayed at touch of a key.

7) Super Capacitor for power carry over system.

8) Supply voltage: 120 V.

9) 365-day advance scheduling.

b. Photoelectric control: Shall be rated 2,000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum gasketed enclosure with 1/2 inch conduit fitting, Tork series 2100, or equal.

2.3 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Provide identification plates for the following unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.

2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.

3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings: Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Dymo Industries Inc., self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; p-touch self adhesive plastic, or Brother P-Touch self sticking laminated plastic labels may be installed.

C. Warning Signs:

1. Provide a warning sign on outside of each door or gate to rooms or enclosures containing high voltage equipment. Signs required reading, "WARNING - HIGH VOLTAGE - KEEP OUT". Provide 2-inch high lettering.

2. Provide a warning sign on each high-voltage non-load break disconnect and fused cutout (not oil filled). Signs required reading, "DO NOT OPEN UNDER LOAD". Provide 2 inch high lettering.

3. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 - EXECUTION

3.1 INSTALLATION AND SUPPORT OF BOXES

A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated adjustable attachment bar hangers between studs to support outlet boxes. When installation is performed in fire rated walls, maintain the wall's rating integrity by means of approved fire stop methods.

B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000 Tessco A1200HS-10, Cooper B-Line B22s-HG, or equal channel spanning main ceiling runner channels. Each box shall be supported from its channel by a 3/8 inch 16 threaded

steel rod with a Unistrut P-4008, Fastenal #48604, Copper B-Line 78101140346 or equal nut and a Tomic No. 711-B Adapta-Stud, or equal. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to rod by means of a 1/2 inch locknut on stud and a 3/8 inch 16 hex nut locking stud to rod.

C. Heights of outlets and equipment indicated on Drawings shall govern. In absence of such indications, following heights shall be maintained with heights measured to centerline unless otherwise noted:

1. Install wall-mounted light switches, and other switches, 48 inches above finished floor. Refer to other Division 26Sections.

2. Install panelboards and terminal cabinets 6 feet 6 inches from finish floor to top of cabinet.

3. The use of extension boxes shall be limited to not more than 1 times the original depth of junction box.

3.2 COVER PLATES

A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified.

B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless steel plates. Flush lighting outlets to be blanked shall be covered with Wiremold 5736 steel covers, or equal, painted to match surrounding finish. Provide stainless steel covers to blank indicated or required surface-mounted outlets.

C. In the following cases, and at required locations. Switch and receptacle plates shall be engraved with the device(s), or fixtures being controlled, or as indicated:.

1. Three-gang and larger gang switches in locations other than classrooms.

2. Lock switches.

3. Pilot switches.

4. Switches so located that operator cannot see fixtures, or items of equipment controlled while his hand is on the switch.

5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etcetera.

6. Receptacles operating at other than 120 V shall be identified with the operating voltage.

7. Switches operating on 277 V shall be identified with the operating voltage.

8. Where indicated on Drawings.

D. Designations shall be as indicated on Drawings or as specified by Architect.

E. Standard GFI cover plates shall be Pass & Seymour 4600, Raco 5028-0, or equal. GFI cover plates shall be provided with a CAM lock mechanism with two keys or a padlock hasp that does not protrude through the face of the cover and will allow the shank of locks keyed Corbin No. 60 keys.

3.3 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, fire alarm control panel(s), fire alarm annunciator(s), power supplies, terminal cabinets, energy management control units, and Information technology system backbone and distribution equipment points.

B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.

C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.

D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area and connected load.

E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.

F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on Drawings.

3.4 PROTECTION

A. Protect Work of this section until Substantial Completion.

3.5 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE WIRES (600 VOLT AC)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Low-voltage wire, splices, terminations and installation.

1.2 SUBMITTALS

A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.1 WIRES

A. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations, and 75 degrees C. in wet locations and shall be listed by UL Standard 83 for thermoplastic insulated wires, listed by Underwriter's Laboratories (UL) for installation in accordance with Article 310 of the California Electrical Code (CEC). Conductors shall be solid copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors. Conductors shall be insulated with PVC and sheathed with nylon. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering are not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN, or THHN.

B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

2.2 STANDARDS

A. THWN/THHN wires shall comply with the following standards:

1. UL 83 for thermoplastic insulated wires.

2. UL 1063 for machine tool wires and cables.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed and walls are completed.

B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer's recommended values

C. At outlets for light, power, and signal equipment, pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.

D. Pressure cable connectors, pre-insulated 3M Scotchlok, Hubbell Power, O-Z/Gedney or equal, Y, R or B spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems; except public address and telephone systems.

E. Joints, splices, taps, and connections to switchboard neutral, bonding or grounding conductors, conductors to ground busses, and transformer connections for wires 6 gage and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 600V and joints, splices, and taps shall be qualified to ANSI C 119.1, UL, NRTL, or equal listed mechanical pressure connections.

F. Connections to any bussing and high-press cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

G. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

H. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of nine current carrying conductors may be bundled together.

I. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.

J. Maintain the conductor required bending radius.

K. Neutral conductors larger than 6 gage, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they

appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.

L. Fire alarm and clock wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks or devices only.

M. Wiring systems shall be free from short circuits and grounds, other than required grounds. The contractor shall be responsible for the testing of feeder and branch circuit conductor's insulation resistance. The insulation of the conductors shall be tested prior to connections to any panelboards, switchboards, variable frequency drives, lighting control systems, ballasts, and wiring devices such as but not limited to GFI receptacles, TVSS receptacles, or equipment. Insulation testing of panelboards and switchboards shall be independently performed from the insulation testing of any conductors as specified in other sections of this specification.

1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of feeder conductors. Tests must be conducted with wires disconnected at both ends.

    a. Provide calibration program records to assure the testing instrument to be within rated accuracy. The test equipment accuracy shall be in accord with the requirements stated by the National Institute of Standards and Technology (NIST).

    b. Test equipment shall be provided with a label stating the date of last calibration. As a minimum the equipment shall have been calibrated within the past 12 months.

    c. Test reports shall include the following:

        1) Identification of the testing organization.

        2) Equipment identification.

        3) Ambient conditions.

        4) Identification of the testing technician.

        5) Summary of project.

        6) Description of equipment being tested.

        7) Description of tests.

        8) Test results.

        9) Analysis, interpretation and recommendations.

2. Utilize the services of an approved independent testing laboratory or a qualified contractor's employee (Technician certified in accordance with ANSI/NETA ETT-2000 Standard for Certification of Electrical Testing Personnel) to perform megger time-resistance insulation testing of branch circuit conductors. Tests must be conducted with wires disconnected at both ends.

   a. Test equipment and report requirements stipulated under paragraph 3.01.N.1 apply to branch circuit testing.

3. Tests shall be performed in the presence of the Project Inspector.

4. Insulation resistance shall not be less than 100 mega-ohms.

3.2 COLOR CODES

A. General Wiring:

1. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray

Neutrals shall be colored-distinguished if circuits of two voltage systems are used in the same raceway.

2. For phase and neutral conductors 6 gage or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

3.3 FEEDER IDENTIFICATION

A. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be by Tyco Electronics, Panduit, Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers from Tyco Electronics, Panduit, Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.4 TAPE AND SPLICE KITS

A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.6 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Provide and install grounding system as indicated or required.

B. Related Requirements:

1. Refer to related sections for their system grounding requirements.

2. Section 26 0500: Common Work Results for Electrical.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. IEEE 142 Green Book.

2. Underwriter's Laboratories (UL).

3. California Electrical Code.

4. Nationally Recognized Testing Laboratory (NRTL) or equal.

1.3 SYSTEM DESCRIPTION

A. Metallic objects on the Project site that enclose electrical conductors, or that are likely to be energized by electrical currents, shall be effectively grounded.

B. Metal equipment parts, such as enclosures, raceways, and equipment grounding conductors, and earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.

C. Metallic systems shall be effectively bonded to the main grounding electrode system.

D. A separately derived AC source shall be grounded to the equipment grounding conductor, and to separate “made” electrode of building grounding electrode system.

E. Electrical continuity to ground metal raceways and enclosures, isolated from equipment ground by installation of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of required size within each raceway connected to isolated metallic raceways, or enclosures at each end. Each flexible conduit over six feet in length shall be provided with a green insulated grounding conductor of required size.

F. Cold water, or other utility piping systems, shall not be utilized as grounding electrodes due to the installation of insulating couplings and non-metallic pipe in such installations.

In addition to bonding to cold water pipe provide at least one of the following made grounding electrodes:

1. A dedicated "made" electrode, fabricated of at least 20 feet of galvanized 1/2 inch diameter rebar encased by at least two inches of concrete, and placed next to the bottom of a concrete foundation, or footing in direct contact with earth A welded extended portion shall surface at the location of the common grounding electrode bus bar and be extended by a 3/0 CAD welded bare copper cable, or be CAD welded directly to the bus. The CAD weld shall be at least four inches above finished floor in a dry location. The main grounding electrode and associated grounding conductors shall be in an enclosure and in conduit.

2. Grounding electrodes as specified hereafter in this section.

3. Concrete enclosed electrode, fabricated of at least 20 feet of No. 2 AWG, minimum size, bare copper conductor, encased by at least two inches of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar shall be connected to copper wire with approved connectors. An external electrode, as specified hereafter or as required by the CEC, shall be installed and connected to foundation or footing rebar.

G. Non-current carrying metal parts of equipment enclosures, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded. Provide a CEC sized grounding conductor in every raceway.

H. Neutral of service conductors shall be grounded as follows:

1. Neutral shall be grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service switchboard, or main switch.

2. Equipment and conduit grounding conductors shall be bonded to that grounding point.

3. If other buildings or structures on the Project site are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.

4. Equipment grounding conductor is installed from switchboard to each individual building. At building, grounding conductor is bonded with power equipment enclosures, metal frames of building, etc., to "made" electrode for that building.

5. Feeder neutrals shall be bonded at service entrance point only, neutrals of separately derived systems shall be bonded at the source only.

I. If there is a distribution transformer at a building the secondary neutral conductor shall be grounded to "made" electrode serving the building.

J. Within every building, the main switchboard or panelboard, shall be bonded to the cold water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold water line.

1.4 SUBMITTALS

A. Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnished yard boxes shall be precast concrete and shall be approximately 14 inches wide by 19 inches long by 12 inches deep or larger, if necessary to obtain required clearances. Boxes shall be furnished with bolt-down, checkered, cast iron covers and cast iron frames cast into boxes. Yard boxes shall be Jensen Precast, Oldcastle Precast, Western Precast, Kistner , or equal.

B. “Made” electrodes shall be copper-clad steel ground rods, minimum 3/4 inch diameter by ten feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grounding electrodes shall be installed in the nearest suitable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, finish elevation of concrete yard boxes shall be two inches above planting surfaces.

B. If concrete enclosed electrode is provided, grounding wire shall be terminated to a suitable copper plate with grounding lugs and must be enclosed in a raceway or box..

C. Grounding rods shall be driven to a depth of not less than eight feet. Permanent ground enhancement material, (GEM) as manufactured by Erico Electrical Products, Loresco Powerset, Tessco Ultrafil or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.

D. Grounding electrodes shall provide a resistance to ground of not more than 25 ohms.

E. When installing grounding rods, if resistance to ground exceeds 25 ohms, two or more rods connected in parallel, or coupled together shall be provided to meet grounding resistance requirements.

F. Ground rods shall be separated from one another by not less than ten feet.

G. Parallel grounding rods shall be connected together with recognized fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.2 TESTING

A. Provide the services of an approved independent testing laboratory to test grounding resistance of "made" electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed as follows:

1. Visually and mechanically examine ground system connections for completeness and adequacy.

2. Perform fall of potential tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.

3. Perform the two point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such as water, gas and panelboard grounds. Metal railings at building entrances and at handicapped ramps shall also be tested.

4. Test shall be performed in the presence of the Inspector.

B. Submit 3 copies of test results to the Architect. Test results shall be submitted on an official form from the independent testing laboratory recording Project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

3.3 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.4 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 05 33 - RACEWAYS, BOXES, FITTINGS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Raceways and wire ways.

2. Conduit installation.

3. Underground requirements.

B. Related Requirements:

1. Section 26 0500: Common Work Results for Electrical.

2. Section 26 0513: Basic Electrical Materials and Methods.

C. Applicable Standards and Codes.(Current Editions)

1. EIA/TIA 569 Standards.

2. National American Standards Institute (ANSI).

3. National Electrical Manufacturer's Association (NEMA).

4. Nationally Recognized Testing Laboratory (NRTL).

5. California Electrical Code (CEC).

6. Uniform Building Code (UBC).

7. Underwriters Laboratory (UL).

1.2 SUBMITTALS

A. Materials List: Provide in accordance with Division 01.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Conduit Materials:

1. Metallic conduit, and tubing shall be manufactured under the supervision of an UL, or another NRTL factory inspection and label service program. Each ten-foot length

of conduit and tubing shall bear the UL or another NRTL label and manufacturer's name.

2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. Couplings, elbows, bends, conduits, bushings and other fittings shall be the same materials and finish as the rigid metallic conduit. Fittings, connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.

3. Electrical metallic tubing shall be steel tubing, zinc-coated with a protective enamel coating inside, manufactured in accordance with NEMA C 80.3. Fittings, couplings, and connectors shall be gland compression type, set screw couplings and connectors not permitted. All parts shall be manufactured in accordance with NEMA C80.3 and UL 6A Electrical metallic tubing is designated hereinafter as EMT. Steel and rain tight fittings shall be approved and listed for the intended application.

4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1.

   a. Connectors and couplings shall be required fittings of the type, which threads into convolutions of flexible conduit.

5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked steel strip construction, UV rated, with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.

6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL, or another NRTL, and shall bear the manufacturer's listed marking.

7. Metal Clad (MC) cable system is not allowed.

B. Sleeves for Conduits: Sleeves shall be adjustable type by Carlon, U.S. Plastic, PEP Plastic or equal.

C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, equivalent Cooper Crouse Hinds Thru-Wall, Legrand Thru-Wall, or equal.

D. Conduit Seal Fittings:

1. Provide conduit seal fittings where indicated on the Drawings. Conduit seals shall be of rigid galvanized steel. Seals in horizontal conduit installations shall be Thomas & Betts EYS, Appleton Type ESU, Crouse Hinds Type EYS, or equal. Seals in vertical conduit installations shall be Thomas & Betts EYD, Appleton Type SF, Crouse Hinds

Type EYD, or equal, with continuous drain. When installing conduit seals make provision for percent fill space reduction in accordance with CEC.

2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are installed in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

E. Wireways shall be 16 gage galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be UL or another NRTL listed, and shall be Square D Type LDB NEMA-1 enclosure for interior applications, or Type RDB NEMA-3R enclosure for exterior applications, or equal by Cooper B-line, Hoffman, Wire Guard, or Circle AW.

F. Penetration in Fire-Rated Structures: Provide 3M, or equal, sealant and fire barriers for installing fire-rated seals around penetrations through floors, walls, and elevator hoistways. Fire stop system must be UL, or another NRTL listed, and classified for through-penetration applications of metallic conduits and busways.

G. Pull Wires: Install 1/8 inch polypropylene cords in empty or spare conduits.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.

2. EMT may be installed in interior concealed applications and in areas approved by owner. EMT shall not be installed in concrete, directly buried underground, outdoors, in pump rooms, Sump pits, or where subject to damage.

3. Flexible steel conduit is not allowed.

4. Liquid-tight flexible steel conduit shall only be installed, except where otherwise specified, for final connection of motor terminal boxes, shop equipment, cafeteria equipment, HVAC equipment and other equipment, or for frequent interchange, and shall be of sufficient length, not exceeding 36 inches, to permit full travel or adjustment of motor on its base. Liquid-tight flexible conduit shall not be used for equipment not requiring adjustment or frequent interchange.

5. Connectors for watertight flexible metal conduit shall be as required for installation and shall be installed to provide a watertight connection.

6. Exposed conduit shall be installed vertically and horizontally following the general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one hole pipe strap.

7. If connection is from a flush wall-mounted junction box, install an approved extension box.

8. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.

9. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be installed to clear access openings.

10. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Public telephone conduit bends and offsets shall be provided with a radius which is not less than ten times trade size of conduit unless otherwise permitted. Refer to underground installation, specified in this section, for radius of bends and off¬sets required for underground installations.

11. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least six inches from covering of hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems.

12. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached.

13. Conduits installed on exposed steel trusses and rafters shall be fastened with factory fabricated conduit straps or clamps, which shall fasten conduit tight against supporting member at point of support.

14. Pipe hangers for individual conduits shall be factory fabricated. Steel rods shall be 3/8 inch for two-inch conduit hangers and smaller and shall be 1/2 inch for 2 ½-inch conduit hangers and larger.

15. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapeze type and shall consist of a cross channel, Steel City Kindorf B-900, Unistrut P-1000, equivalent Cooper B-Line or equal, suspended with a 3/8 inch minimum diameter steel rod at each end. Rods shall be fastened with nuts, top and bottom to cross-channel and with square washers on top of channel. Conduits shall be clamped to top for cross-channel with conduit clamps, Steel City Kindorf C-105 or Unistrut P-1111 through P-1124, equivalent

Cooper B-Line, or equal. Conduits shall not be stacked one on top of another, but a maximum of two tiers may be on same rack providing an additional cross-channel is installed. Where a pipe rack is to be longer than 24 inches, or if the supported weight exceeds 500 pounds, submit Shop Drawings of installation to the Architect for review.

16. Conduits suspended on rods more than two feet long shall be rigidly braced to prevent horizontal motion or swaying. Installation shall meet zone 4 seismic requirements.

17. Factory fabricated pipe straps shall be one or two-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.

18. Hangers, straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is placed, or with approved concrete anchors. Under wood, install bolts, lag bolts, or lag screws; under steel joists or trusses, install beam clamps. Contractor shall submit size of anchors, bolts, screws, and installation method to Architect for approval prior to start of any work.

19. Conduits shall be supported at intervals required by code, but not to exceed ten feet. One inch and smaller exposed conduits shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits.

20. Conduits stubbed up through a roof shall be flashed with a waterproof flashing. Refer to Division 07 for additional requirements.

21. Bushings and locknuts for rigid steel conduit shall be steel threaded insulating type. Setscrew bushings are not permitted.

22. Routing of conduits may be changed providing length of any conduit run is not increased more than ten percent of the length indicated on Drawings.

B. Underground Requirements:

1. Conduits installed underground shall be entirely encased in three inch thick concrete on all sides , except where otherwise specified. Provide required spacers to prevent any deflection when concrete is placed and to preserve position and alignment. Conduits and raceways shall be tied to spacers. Anchors shall be installed to prevent floating of conduits and raceways during placing of concrete. Provide red colored concrete to encase conduits of systems operating above 600 volts.

2. Underground conduits and raceways shall be buried to a depth of not less than 24 inches below finished grade to top of the concrete envelope, unless otherwise specified.

3. Assemble sections of conduit with required fittings. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be provided liquid-tight. Bends at risers shall be completely below surface where possible.

4. Conduits and raceways in a common trench shall be separated by at least three inches of concrete. Electrical power and/or lighting conduit runs installed in a common trench with conduits containing signal system wiring such as telephone, computer networking, shall maintain a separation of a minimum of six inches from these types of signal system conduits and raceways. Electrical power, lighting and signal conduits and raceways installed in a common trench with other utility lines such as gas, water, sewer and storm lines shall maintain 12 inches separation from these types of utility lines.

5. The Inspector will observe underground installations before and during concrete placement. A mandrel shall be drawn through each run of conduit in presence of the Inspector before and after placing concrete. Mandrel shall be six inches in length minimum, and have a diameter that is within 1/4 inches of diameter of conduit to be tested.

6. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of required solvent-weld cement supplied by conduit manufacturer. Non-metallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1 ½-inch inclusive shall not be less than 24 inches. Bends at risers and risers shall be PVC-coated rigid steel conduit. Radius of curve of bends or offsets in non-metallic conduit for public telephone system shall be not less than ten times trade size of conduit, unless otherwise specifically permitted.

7. Furnish and install a six-inch wide, polyethylene, red underground barrier type 12 inches above full length of concrete reading, "CAUTION ELECTRIC LINE BURIED BELOW".

8. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies requiring service.

9. Protect inside of conduit and raceway from dirt and rubbish during construction by capping openings.

10. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, and manholes. Under floor standing switchboards and motor control centers provide a four-inch galvanized nipple with ground bushing.

11. Underground conduit for systems operating above 600 volts shall be a minimum size of five inches.

12. Underground conduits and raceways shall be swabbed prior to wire pull.

C. Slabs on Grade:

1. Unless specifically reviewed by the Architect, conduits 1 ¼-inches and larger are not permitted to be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom

where conduits occur to provide three inches of concrete between conduit and earth. Required excavation shall be part of the Work of this section.

2. If concrete slab is five inches or more in thickness with a moisture barrier plastic sheet between earth and slab, one inch and smaller conduits shall be installed in the slab with a minimum of one inch concrete between earth and conduit.

D. Concrete Walls, Beams, and Floors: Provide sleeves where conduits pierce concrete walls, beams, and floors, except floor slabs on grade. Sleeves shall provide 1/2 inch clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, seal with required sealant and backer materials between conduit and sleeve to provide a watertight joint. Sealant shall be as indicated in Section 07 9200: Joint Sealants.

3.2 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.3 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS AND SIGNAL TERMINAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Lighting and power distribution facilities, including panelboards.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 26 0500: Common Work Results for Electrical.

3. Section 26 0513: Basic Electrical Materials and Methods.

4. Section 26 5000: Lighting.

1.02 SUBMITTALS

A. Provide in accordance with Division 01.

B. Shop Drawings: Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.

C. Installation Instructions: Submit manufacturer's written installation instructions.

1.03 DESIGN REQUIREMENTS

A. Panelboards:

1. Panelboards shall be wall-mounted, enclosed safety type with 277/480 volt, four wire, or 120/240 volt, single phase 3-wire, solid neutral, mains as indicated on Drawings or specified.

2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be fully rated, with ampere rating marked on handle and shall indicate on/off and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL, or other NRTL as ground fault devices. Provide appropriate lug kit of sufficient size to accommodate the feeders.

3. Two- and three-pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, tamper-proof, ambient compensated, single handle, internal common trip, and quick-make, quick-break mechanism with silver alloy contacts. Circuit breakers shall be fully rated or as otherwise indicated on the Drawings.

4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion-resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall be furnished with interchangeable trip units. Handles of main and subfeeder

circuit breakers shall be provided cabinet door. Voltage rating shall be as indicated on Drawings.

5. Circuit breakers shall be fully rated and of one-piece, bolt-on type and shall meet short-circuit interrupting capacity requirements indicated on Drawings

6. Internal connections shall be fabricated with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. Terminals shall be furnished with copper conductors. Panelboards fed by conductors having over-current protection greater than 200 amperes shall be protected on supply side by over-current devices having a rating not greater than that of panelboards. Copper bussing shall be fully rated. Heat rated bussing is not acceptable.

7. Except where otherwise indicated, circuit breakers shall be in two vertical rows connected to bus bars in a distributed phase arrangement. Two-pole branches shall be balanced on busses. Single pole branches shall be numbered adjacent to its circuit breaker, with odd numbers on left and even numbers on right.

8. Specified circuit breaker spaces shall be furnished with hardware required for future installation of circuit breakers.

9. Provide locking devices for individual circuit breakers. Padlocking devices shall be secured to circuit breakers and by panel dead front plates.

B. Panelboard Cabinets:

1. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall be furnished with at least six-inch high gutters at top and bottom where feeder cable size exceeds four gage or where feeder cable passes through cabinet vertically. Cabinets shall be furnished with top and bottom gutters sized as required by inspection department having jurisdiction, but never less than six inches where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than four inches wide. Width of cabinets shall be 20 inches, unless otherwise indicated on Drawings.

2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins. Hinge flanges shall be welded to door and trim. Doors shall be equipped with flush type, spring-latching, locks for metal doors.,

3. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors keyed to Corbin No. 60 keys.

4. Provide and install panelboard manufacturer's permanent circuit number kit option.

5. Panelboards with control devices in compartment shall arrive at the Project site completely assembled with control devices installed and wired.

6. Outdoor cabinets shall be NEMA Type 3R. Construction shall be formed from code gage galvanized steel with ANSI No. 61 gray enamel finish. Provide heavy-duty, three point latching, vault type door handles with padlocking provisions. Provide stainless steel or galvanized butt hinges on doors. Padlocks shall be furnished, keyed to Corbin No. 60 keys.

7. Self-tapping screws and bolts not permitted.

C. Panelboard Schedule: Provide a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names shall be determined at the Project site and shall not necessarily be those indicated on the Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be installed in a frame under transparent plastic 1/32 inch thick on inside of each panelboard cabinet door.

D. Panelboard nameplate: Provide a nameplate identifying panelboard. Plates shall be black and white plastic nameplate stock, with character cut through black exposing white and shall bare designation of service. Name plate shall be mechanically fastened to switchboard.

E. Provide additional labeling on dead-front of panelboard. Label shall be a P-Touch or equal with a minimum width of 3/8 inch with black letters on white background. Label shall re-identify panelboard and also identify name and location of power source feeding this panel. Location information shall include building name if located in different building and name or room location. If power source is installed in same room, label should indicate source name and "In this Room"

F. Panelboard Standards: Panelboards shall be UL, or other NRTL listed and labeled. Panelboards shall meet latest revisions of following standards:

1. California Electric Code, Article 384.

2. UL 67, Panelboards.

3. UL 50, Cabinets and Boxes.

4. UL 943, GFCI.

5. UL 489, Molded Case Circuit Breakers.

6. NEMA PB1.

7. Federal Specifications W-P- 115C and WC-375B.

G. Signal Terminal Cabinets:

1. Signal terminal cabinets shall conform to the Specifications for panelboard cabinets, except as modified herein.

2. Terminal cabinets shall be flush type, with two-inch trim or surface mounted type, as indicated on Drawings. Terminal cabinets shall be furnished with sections and barriers to separate each system. Sections over 24 inches in width shall be provided with double doors and locks. Terminal cabinets, or sections of terminals housing separate systems, shall measure 12 inches long by 18 inches high by 5 ¾-

inch deep, unless otherwise indicated on Drawings. Trims for sectional cabinets shall be of one-piece construction.

3. Terminal cabinets shall be furnished with ¾ inch thick plywood. Plywood shall be fastened in place with machine screws or factory installed mounting screws.

4. Flush-mounted terminal cabinets shall be finished as specified for flush-mounted panelboard cabinets. Surface and semi-flush mounted terminal cabinets shall be finished as specified for surface-mounted panelboard cabinets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Panelboards shall be manufactured by Siemens, General Electric, Cutler Hammer, Square D.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Panelboards shall be located so they are readily accessible and not exposed to physical damage.

B. Panelboards installed outdoors shall be specifically listed for wet locations and shall be weatherproof in NEMA Type 3R cabinets.

C. Panelboard locations shall provide sufficient working space around panels to comply with the California Electrical Code.

D. Panelboards shall be securely fastened to structure and mounted on surface by at least four points.

E. Unused openings in cabinets shall be effectively closed as required by the manufacturer.

F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.

G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.

H. Lugs shall be suitable and listed for installation with the conductor being connected.

I. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

J. Maintain the required bending radius of conductors inside the cabinet.

K. Clean the cabinet of foreign material such as cement, plaster, and paint.

L. Distribute and arrange conductors neatly in the wiring gutters.

M. Use the manufacturer's torque values to tighten lugs.

N. Before energizing panelboards, the following steps shall be taken:

1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.

2. Remove shipping blocks from component devices and panelboard interiors.

3. Manually exercise circuit breakers to verify they operate freely.

4. Remove debris from panelboard interior.

O. Follow manufacturer's instructions for installation.

P. Do not install in highly corrosive environments, unless rated for the application.

3.02 PROTECTION

A. Protect the Work of this section until Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 50 00 - LIGHTING

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. Refer to lighting fixture schedule and Lighting Designer's notes and Control intent Schedule.

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Light fixtures model numbers were determined at the time this specification was written; model numbers may need to be modified, or may require the addition or deletion of options to fully meet specification requirements.

C. Related Requirements:

Division 01 - General Requirements.

Section 26 0500: Common Work Results for Electrical.

Section 26 0513: Basic Electrical Materials and Methods.

Section 26 0526: Grounding and Bonding.

Section 26 0519: Low-Voltage Wires (600 Volt AC).

DEFINITIONS

D. CCT: Correlated color temperature.

E. CRI: Color Rendering Index.

F. Fixture: See "Luminaire."

G. IP: International Protection or Ingress Protection Rating.

H. LED: Light-emitting diode.

I. Lumen: Measured output of lamp and luminaire, or both.

J. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Product Certificates: For each type of luminaire.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Provide a two year labor warranty.

C. Provide material warranty as specified:

1. Lamps: two years.

2. Ballasts: five years.

3. Standards: one year.

4. Controls: three years.

D. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.

PART 2 - PRODUCTS

2.1 MATERIAL AND FABRICATION

A. Lighting fixtures shall be the type indicated on Drawings and as specified. Fixtures of same type shall be of one manufacturer.

B. Fixtures shall be of the types and manufacturers described in the FIXTURE TYPES section below, with lamps, wattage and voltage as indicated on Drawings Specific manufacturer and model number references are indicated as a standard of performance and quality; other manufacturers' models may be supplied provided the product meets or exceeds the specifications. The alternate fixtures must achieve the same photometric levels and uniformity ratios.

C. All fixtures shall be baked-on enamel or powder-coated, unless otherwise specified in subsections below.

D. Lighting fixtures shall have a minimum luminaire efficiency rating (LER) equal or greater than 75.

E. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

2.2 LUMINAIRE REQUIREMENTS

A. 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.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. CRI of minimum 85. CCT as indicated in the Lighting Fixture Schedule.

F. Rated lamp life of minimum **35,000** hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Integral driver.

I. Nominal Operating Voltage **120 V AC**

J. Retain "Lens Thickness" Subparagraph below for all diffuser and globe types.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

2.3 LED DRIVER

A. LED driver shall be installed in an electrical enclosure.

B. Wiring inside enclosure shall comply 600V/105 degrees rating or higher.

C. LED driver shall comply with UL standard UL1012.

D. LED driver shall have Class A sound rating.

E. LED driver shall be UL certified for use in a dry or damp location.

F. LED driver shall tolerate sustained open circuit and short circuit output conditions without damage.

G. LED driver shall comply with the requirements of the FCC rules and regulations, Title 47 CFR Part 15 Non-Consumer (Class A).

2.4 EXIT SIGNS

A. Manufacture: See "Fixture Types" as shown on the drawings.

B. Mounting Method: For ceiling, back, end mounting or recessed as indicated on drawings. Subcontractor is cautioned to coordinate exit sign locations with Architectural details. Mounting height, in general, up 90 inches or one inch above door casing where mounted over doors; verify all exit sign locations with Executive Architect-Engineer prior to installation of outlet boxes.

C. Finish: White face for both with clear baked enamel protective coating.

D. Height of Letters: 6 inches (150 mm).

E. Conduit Knockouts: Construct all exposed back, top, bottom and side surfaces of any fixture so that no conduit knockout provisions are visible.

F. Number of Faces: As required for the position of the fixture as shown on the drawings.

G. Directional Arrows: Provide for all exit signs, except those shown to be recessed or located directly above the exit door.

H. Lamps: Light-emitting diode (LED), RED color.

EXECUTION

2.5 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

2.6 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

2.7 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

2.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

2.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

2.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to 2 visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Owner.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 10 00 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 - General Requirements

B. Section 01 11 00 - Summary of Work

C. Section 01 50 00 - Construction Facilities and Temporary Controls

D. Section 01 73 29 – Cutting and Patching

E. Section 01 74 19 - Construction and Demolition Waste Management

F. Section 31 22 00 – Grading

G. Section 31 23 16 – Excavation and Fill for Paving

H. Section 31 23 19 – Excavation and Fill for Structures

I. Section 31 23 23 – Excavation and Fill for Utilities

J. Division 22 – Plumbing

K. Division 23 – HVAC

L. Division 26 – Electrical

1.2 SUMMARY

A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:
   1. Protection of existing improvements to remain.
   2. Cleaning existing improvements to remain.
   3. Disconnecting and capping utilities.
   4. Removing debris, waste materials, and equipment.
   5. Removal of items for performance of the Work.
   6. Salvageable items to be retained by the Owner.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
4. Concrete stair treads to receive non-slip stripes.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

B. Existing conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
   1. Use sufficiently detailed photographs or videotape
   2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

C. Contractor shall be responsible for obtaining all necessary permits, approvals and Construction Manager's authorization for disposal of material resulting from clearing and grubbing operations in areas not already specified in the contract documents.

1.4 QUALITY ASSURANCE

A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.

B. Prior to commencement of work, schedule a walkthrough with the owner, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition work to create least possible inconvenience to the public and facility operations.

D. Related Standard: ANSI/ASSE A10.6.

E. Use means necessary to prevent air pollution or dust from becoming a nuisance to the public, to neighbors and to others performing work on or near the job-site. Comply with governing regulations.

F. Maintain access to the job-site, other neighboring property and streets at all times.

G. Protection of persons and property

1. Provide barricades, warning signs at open depressions and holes on adjacent property and public accesses.
2. Provide operating warning lights during hours from dusk to dawn each day or as otherwise required.
3. Protect existing remaining structures, utilities, sidewalks, pavements other facilities from damage as caused by settlement, undermining, washout or other hazards created by site-clearing operations of this Section.
4. Provide and maintain pedestrian and vehicular access in accordance with Work Area Traffic Control Handbook (WATCH), latest edition.

1.5 FIELD CONDITIONS

A. Drawings may not indicate in detail all demolition work to be performed. Examine existing conditions to determine the full extent of required demolition.

B. Repair damage to existing improvements or damage due to excessive demolition.

C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.

D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.1 HANDLING OF MATERIALS

A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the county project manager. Items shall be cleaned, packaged and labeled for storage.

B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.1 GENERAL

A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.
2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.

B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the County Project Manager.

3.2 DEMOLITION

A. Do not throw or drop materials. Furnish ramps or chutes as required by the work.

B. Remove existing construction only to extent necessary for proper installation of work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.3 TREE AND STUMP REMOVAL

A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.

B. Fill and compact excavation from tree and stump removal. Fill in 6-inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.
1. Back filling shall not commence until the excavation is inspected and tested.

3.4 CUTTING EXISITNG CONCRETE AND BITUMNOUS SURFACES

A. Cutting of existing concrete/bituminous surfaces shall be performed by skilled workers familiar with the requirements and space necessary. Perform cutting with proper tool or concrete cutting saw.

B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.

C. Prior to cutting or coring concrete/bituminous surfaces, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.5 PATCHING

A. Patch or repair materials to remain when damaged by the performance of the work of this section. Finish material and appearance of patch and/or repair work shall match existing.

B. Remove concrete broken beyond the indicated limits to the nearest joint or score line, and replace with new concrete to match existing.

3.6 CLEANING

A. Clean existing materials to remain with appropriate tools and equipment.

B. Protect existing improvements during cleaning operations.

C. Debris shall be dampened by fog water spray prior to transporting by truck.

D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.

E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Project Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition work progresses.

F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 13 13 – SELECTIVE TREE AND SHRUB REMOVAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Company Qualifications: The Company performing the Work of this section shall be insured and have a minimum of five (5) years of experience in tree removal and trimming. The person supervising the Work shall also have a minimum of five (5) years of experience in tree removal and trimming.

B. The work shall consist of the removal and disposal of selected trees including stumps and roots.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 31 Section "Site Clearing".

B. Division 31 Section "Grading".

C. Division 31 Section “Excavation & Fill”

1.3 SUBMITTALS

A. Submit detailed experience and qualifications description of tree trimming and removal. Experience and qualifications package should include a description of the types of equipment and experience that can be provided.

1.4 COORDINATION AND SCHEDULING

A. Coordinate work with the County Representative to schedule all work at the start of the project and to minimize disruptions to street operations. Provide a traffic plan at the start of the project for approval by the County Representative.

B. The County Representative shall be notified at least three (3) working days prior to performing the work, and should be provided a schedule for the works progression.

C. The County Representative may limit or restrict work areas and scheduling of the tree trimming and/or removal based upon project progress.

1.5 PROJECT CONDITIONS

A. Protect existing trees and plants during performance of the Work unless otherwise indicated. Surround trees and plants indicated to remain within the grading limit line with temporary orange construction fencing or solidly constructed wood barricades as

required. Protect root systems from smothering. Do not store excavated material, or allow vehicular traffic or parking within the canopy drip line. Restrict foot traffic to prevent excessive compaction of soil over root systems.

PART 2 - PRODUCTS

2.1 MATERIALS

A. As necessary for the proper completion of this work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Protection:
   1. Prevent damage to buildings, pavement, pipes, conduits, poles and other structures above and below ground that are adjoining or included in the contract area. Repair damage resulting from the contractor's negligence.
   2. Protect existing trees and shrubs not to be removed. Cut back to point of branching all broken branches and skinned areas.
   3. Store materials and equipment in cleared areas away from tree roots. Prevent employees and equipment from trampling over woodland, existing planting, and established lawns.

3.2 REMOVALS – TREES ENTIRELY

A. Only plant material shown on the Plans to be removed and disposed of must be removed and disposed of. Prior to the clearing and grubbing operations on a particular property or portion of the work site, the County will mark and designate the trees, shrubs, and ground cover areas to be removed and disposed of. Remove all trees indicated per Civil Demolition Plan.

B. Top and limb all trees before falling, unless otherwise approved by the County Representative.

C. Removed trees, stumps and roots are the property of the Contractor and must be removed from the project site. All debris resulting from tree removal work, including broken branches, fallen leaves, wood chips, and sawdust produced from stump and root removal work, must be promptly removed from the work site.

D. If the tree to be removed is within the drip line of another tree that is to remain, the tree removal work must be done under the direction of a Certified Arborist. The Contractor must submit the name of the Certified Arborist to the Agency, in writing, a minimum of 4 Working Days prior to the start of clearing and grubbing operations.

E. Chip out stumps and all large roots greater than 4" to a depth of not less than **24 inches** below finished grade. The area of removal shall be a min. of 7'-0" away from the existing tree trunk in all directions.

F. Tree trunk stumps will be completely removed or ground to a depth that stump and roots are a minimum of 24 inches (2 feet) below grade. If new planting is going to occur over ground stump, the conditions may require a deeper grinding or woody stump and root removal as necessary. Contractor must prepare planter or turf areas to meet new planting requirements throughout the project site.

G. Remove all wood chips before importing new topsoil. Backfill stump holes with imported topsoil to establish grades per Civil Grading Plan.

H. The holes resulting from tree stump and tree root removal activities must be backfilled as specified in Section 31, "Excavation & Fill", of these Specifications.

3.3 CLEAN UP – TREES TRIMMED AND REMOVED

A. Remove and dispose of all logs, tree trimmings, and debris from County and City property. Leave work area in a neat uncluttered condition, where indicated or specified.

3.4 MAINTENANCE AND RESTORATION

A. Restore grades to indicated levels where settlement or damage due to performance of the Work has occurred. Correct conditions contributing to settlement or damage.

B. Restore pavements, walks, curbs, lawns, and other exterior surfaces damaged during performance of the Work to match the appearance and performance of existing corresponding surfaces as closely as practicable.

END OF SECTION

SECTION 31 22 00 – GRADING

PART 1 - GENERAL

1.1 RELATED DOCOMENTS

A. Division 01 – General Requirements

B. Section 31 10 00 – Site Clearing

C. Section 31 23 16 – Excavation and Fill for Pavement

D. Section 31 23 19 – Excavation and Fill for Structures

E. Section 31 23 23 – Excavation and Fill for Utilities

F. Section 31 23 26 – Base Course

G. Section 32 90 00 - Planting

1.2 SUMMARY

A. Section Includes:
   1. General exterior grading, cutting and filling, including grading for paving and planting areas.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.4 QUALITY ASSURANCE

A. General:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
   4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.2 ROUGH AND FINE GRADING

A. Grading shall be in accordance with Geotechnical Report.

B. Rough grade area sufficiently high to require cutting by fine grading:
   1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
   2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
   3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
   4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.
   5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

C. Base or Subgrade:
   1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:
      a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.

b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be 95 percent minimum for the top 8 inches below subgrade.
c. Install base course in accordance with Section 31 23 26 - Base Course.

2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.3 EXCESS MATERIAL DISPOSAL

A. Remove rubbish, debris, and waste materials and legally dispose off the project site.

3.4 PROTECTION

A. Protect the work of this section until Substantial Completion.

END OF SECTION

SECTION 31 23 16 – EXCAVATION AND FILL FOR PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – General Requirements

B. Section 01 45 24 – Environmental Import/Export Materials Testing

C. Section 31 10 00 – Site Clearing

D. Section 31 22 00 – Grading

E. Section 31 23 23 – Excavation and Fill for Utilities

F. Section 31 23 26 – Base Course

G. Section 32 01 17 – Pavement Repair

H. Section 32 13 13 – Site Concrete Work

1.2 SUMMARY

A. Sections Includes:
   1. Excavating, filling, backfilling, and compacting for Project site pavement, planting areas.

1.3 ACTIONS SUBMITTALS

A. Imported Soils: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this section.

1.4 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 45 24 - Environmental Import/Export Material Testing.

1.5 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.6 PROJECT CONDITIONS

A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the foundation investigation and soils report is available for examination at the Architect's office during regular office hours of Architect.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

A. Fill and backfill material shall be a granular material previously removed from excavation or imported fill material, free of clods and stones larger than 3 inches, (2½ inches for utility trenches) foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended and aerated to stabilize and upgrade the material.

C. Bedding material from trench bottom to one foot above the pipe:
   1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
   2. Sand complying with the Specifications for cement concrete aggregates.

D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site, or incorporated in fill, if reviewed by a geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise indicated, no such material shall be imported from outside the Project site.

E. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

2.2 BASE MATERIALS

A. Concrete Slabs on Grade: Provide "Crushed Aggregate Base" as specified in Standard Specifications for Public Works Construction, Section 200 - Rock Materials, with 3/4 inch maximum size aggregates. Provide 3 inch thick base, unless noted otherwise.

B. Bituminous Surfacing: Provide as indicated on Drawings and specified in Section 31 23 26 – Base Course.

PART 3 - EXECUTION

3.1 SITE PREPARTION

A. Clear the Project site as required in Section 31 10 00 - Site Clearing.

3.2 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect existing improvements including landscaping against damage. Repair or replace damaged items.

C. Protect existing utility services and distribution systems from damage or displacement.

D. Protect the Work of this section until Substantial Completion.

3.3 EXISTING UTILITY LINES

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

3.4 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork", except as modified herein.

B. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

C. Where indicated or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by

installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

3.5 EXCAVATION

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300 - Earthwork, except as modified herein. Install and compact fill in layers not to exceed 6 inches in thickness.

B. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. In addition to the requirements of this section, import and/or exported materials shall comply with the requirements of Section 01 45 23.

D. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.

E. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit the samples to an independent county approved testing laboratory for testing.

F. Initial sampling and testing shall be performed before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and entity responsible for the source site. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial and additional samples from the identified site and submit samples for required testing.

G. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

H. The independent approved testing laboratory shall perform the required tests and report results of tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, County Project Manager, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents and California Building Code. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report as required by the CBC.

I. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis

J. Upon completion of import operations, provide the County Project Manager a certification statement attesting that imported material has been obtained from the identified source site.

3.6 INSTALLATION OF MATERIALS

A. Pavement: Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but not more than 1 in 20. Provide adequate drainage at all times during installation of the Work of this section.

3.7 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

B. Install and compact sand bedding to provide a uniform bearing under the full length of piping and conduits.

C. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 95 percent.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.8 INSPECTION AND TESTING

A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality for testing as set required in Part 2, and observe installation and compaction of fill materials.

B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source and submit samples to the independent approved testing laboratory before delivery to the Project site.

C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.9 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 19 – EXCAVATION AND FILL FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – General Requirements

B. Section 01 45 24 – Environmental Import/Export Materials Testing

C. Section 31 10 00 – Site Clearing

D. Section 31 22 00 – Grading

E. Section 31 26 16 – Excavation and Fill for Paving

F. Section 31 23 23 – Excavation and Fill for Utilities

1.2 SUMMARY

A. Section Includes:
   1. Excavating, backfilling, and compacting for structures
   2. Fill materials

1.3 PROTECTIVE REQUIREMENTS

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.4 SUBMITTALS

A. Imported Soils: A Geotechnical Engineer, retained by the Owner as an Owner Consultant, will obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this Section.

B. Shoring calculations as required in Article 3.03 of this Section.

1.5 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 45 24 - Environmental Import/Export Materials Testing.

1.6 TESTING

A. Owner will retain a Geotechnical Engineer as an Owner Consultant who will provide observations, tests, inspections and approvals identified in the Contract Documents as being responsibility of Owner.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.05 of this Section.

1.7 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be a granular material previously removed from excavation, or imported fill material, free of large clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:
   1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.
   2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent

from air dry to saturation. Imported material shall be clean and free of rubbish, debris and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Brick rubble and broken concrete originating from the Project site shall be legally disposed of off the project site. No such materials shall be imported from outside the project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size	Percentage Passing
3/4 inch	100
3/8 inch	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.
3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed and approved by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Clear the Project site as indicated in Section 31 10 00 - Site Clearing.

3.2 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

C. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving-in, erosion or gullying of sides.

D. Divert or de-water excavations until concrete is placed, forms are removed, and backfilling is complete.

3.3 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of Cal-OHSA.

3.4 EXCAVATION

A. Form sides of slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required.

B. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.

C. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

D. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

E. Calculate excavation quantities based on elevations or depths indicated on Drawings.

F. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

G. Special preparation of bottom of excavated planes areas: Excavate areas designated on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

3.5 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and/or exported materials shall comply with the requirements of Section 01 45 24 - Environmental Import/Export Materials Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. The geotechnical engineer will submit all samples to a County approved independent testing laboratory for testing.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and will submit samples to the approved independent testing laboratory for testing.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory will perform the required tests and report results of tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, architect, OAR, contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents and CBC. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer will submit a verified report to the Owner as required by CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.6 BACKFILLING

A. After concrete has been placed, forms removed and concrete work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris, and other waste materials from excavations before placing backfill.

B. Before installing backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or dampproofing against damage during backfilling

operations with required protection board. Remove bracing as backfill operation progresses.

C. Do not furnish or install expansive soils for below grade building walls.

D. Install each layer of material in a not to exceed thickness of 6 inches, unless otherwise required.

E. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

F. Install wall backfill before installing railings and fences on walls.

G. Impervious backfill materials shall be installed in layers along with and by the same methods specified for structure backfill. Impervious backfill materials shall be at the approximate grade and elevation and where exposed to erosion, shall be covered with at least a 12-inch layer of fill material as reviewed by the Geotechnical Engineer.

H. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

I. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

3.7 COMPACTING

A. Compact each layer of fill material by tamping, sheepsfoot rollers or pneumatic-tired rollers, to such extent as to provide specified relative compaction. At inaccessible locations, compact to specified requirements with hand-held, operated and directed compaction equipment.

B. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 90 percent.

C. Do not compact by flooding or jetting.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.8 INSPECTION AND TESTING

A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The Geotechnical Engineer will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the Geotechnical Engineer.

D. The Geotechnical Engineer will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place and before first placement of concrete.

3.9 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 23 – EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – General Requirements

B. Section 31 10 00 – Site Clearing

C. Section 31 22 00 – Grading

D. Section 31 23 16 – Excavation and Fill for Paving

E. Section 32 13 13 – Site Concrete Work

F. Section 33 11 00 – Site Water Distribution Utilities

G. Section 33 40 00 – Storm Drainage Utilities

H. Division 22 – Plumbing

I. Division 26 – Electrical

1.2 SUMMARY

A. Section Includes:

1. Trenches for utility lines such as water, gas, irrigation, storm drain and sewer lines, concrete-encased conduits, manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes, and other utility appurtenances.

1.3 ACTION SUBMITTALS

A. Imported Soils: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this section.

1.4 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 45 24 - Environmental Import/Export Material Testing.

1.5 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.6 PROJECT CONDITIONS

A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the foundation investigation and soils report is available for examination at the Architect's office during regular office hours of Architect.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

A. Bedding material from trench bottom to one foot above the pipe:
   1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
   2. Sand complying with the Specifications for cement concrete aggregates.

B. Backfill Materials:
   1. Excavated trench material to be installed for backfilling shall be clean, free of large clods, and stones larger than 2 ½-inch in any dimension.
   2. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.
   3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.
   4. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

PART 3 - EXECUTION

3.1 GENERAL

A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall be forwarded to the OWNER. For on-site utilities, retain a state-licensed third party underground utility locating service.

B. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 50 00 - Construction Facilities and Temporary Controls, and in accordance with Cal-OSHA standards and requirements.

C. Saw-cut concrete or bituminous paving for trench installation.

D. Trenches over 5 feet in depth shall conform to the Cal-OSHA.

E. Where indicated and required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

F. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.

G. Do not install piping lengthwise under concrete walks without review by the Architect.

H. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.

1. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest adjoining finished grade, as follows:

Steel Pipe	24 inches below finished grade
Copper Water Tube	18 inches below finished grade
Cast-Iron Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structures	36 inches below finished grade
Soil, Sewer & Storm Drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load.

	(Install polypropylene sewer pipe with at least 24 inches coverage)
Irrigation Pipe:	nonpressure pipe 12 inches, pressure pipe 24 inches

2. Trench width shall provide ample space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

I. Evaluation Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

J. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

K. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and tanks.

L. Do not install backfill until required inspections and testing is completed.

M. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Project Inspector.

N. Install backfill materials in layers not exceeding 8 inches in thickness and compact to 95 percent of the maximum density.

O. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.

P. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Q. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 01 17, Pavement Repair.

3.2 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this section, import and/or exported materials shall comply with the requirements of Section 01 45 23.

C. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.

D. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit the samples to an independent city approved testing laboratory for testing.

E. Initial sampling and testing shall be performed before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and entity responsible for the source site. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial and additional samples from the identified site and submit samples for required testing.

F. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory shall perform the required tests and report results of tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, County Project Manager, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents and California Building Code. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report as required by the CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the County Project Manager a certification statement attesting that imported material has been obtained from the identified source site.

3.3 INSTALLATION OF MATERIALS

A. Utilities:

1. Do not install backfill until the Work of this section has been inspected and tested. Do not furnish or install materials excavated from the Project site containing materials not permitted for backfill.
2. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the inspector of LA County.
3. Install backfill in layers not exceeding 4 inches in thickness, except cement-sand slurry.
4. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grades plus one inch.

3.4 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

B. Install and compact sand bedding to provide a uniform bearing under the full length of piping and conduits.

C. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 95 percent.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.5 INSPECTION AND TESTING

A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality for testing as set required in Part 2, and observe installation and compaction of fill materials.

B. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.6 PROTECTION

A. Protect the Work of this section until Substantial Completion

3.7 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 26 – BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – General Requirements

B. Section 31 1000 – Site Clearing

C. Section 31 2200 – Grading

D. Section 31 2316 – Excavation and Fill for Paving

E. Section 32 12 16 – Asphalt Paving

F. Section 32 1313 – Site Concrete Work

1.2 SUMMARY

A. Section Includes:

1. Installation of base material.

1.3 ACTION SUBMITTALS

A. Prior to import, submit written certification to County project manager that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082, and obtain written approval from the County of Los Angeles prior to import at the subject site, refer to Article 2.02 for sampling frequency.

B. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by the County of Los Angeles prior to importing the material. A statement on company letterhead from the source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal. To be considered for a variance, the Contractor shall submit a documentation package, which includes all of the aforementioned information at least 48 hours in advance of planned import.

1. Frequently used suppliers:
    a. Hansen Aggregates.
    b. Vulcan Materials, Reliance Company.
    c. Vulcan Materials Durbin.

C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

D. Sample: Submit Sample of proposed base course material.

1.4 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition, except as modified herein.

PART 2 - PRODUCTS

2.1 UNTREATED BASE MATERIALS

A. The following base materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.
    1. Crushed Aggregate Base.
    2. Crushed Miscellaneous Base.
        a. CMB meeting requirements of Article 1.02, A, may be used on-site for pavement base only.
        b. CMB may be used off-site when in accordance to the Greenbook.

B. Materials generated on site shall not be used as a base course material.

2.2 SOURCE QUALITY CONTROL

A. Sampling and testing of imported and/or exported crushed miscellaneous base (CMB) shall be performed in accordance with the following Table 1 schedule:

TABLE 1: MINIMUM SAMPLING FREQUENCY

Volume (CY)	Sampling Frequency
0 to 500	1 per 100 Cubic Yards
501 to 1,000	1 per 250 Cubic Yards
1,001 to 5,000	1 per 250 Cubic Yards for first 1,000 Cubic Yards 1 per 500 CY there-after
5,001 to 20,000	12 samples for first 5,000 Cubic Yards 1 per 1,000 Cubic Yards there-after

over 20,000	1 per 2,000 Cubic Yards for first 20,000 Cubic Yards 1 per 2,500 CY thereafter

2.3 MATERIAL APPROVAL

A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The owner may choose to have additional tests performed by a geotechnical engineer, retained by the Owner, before installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 22 00 - Grading.

3.2 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.3 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 63 29 DRILLED CONCRETE PIERS (CAISSONS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Information concerning a sub-surface soil investigation by the Owner's Geotechnical Engineer is available and will be furnished by the Owner upon request. The contractor may use the data included therein for his general information only. The Architect/Engineer is not responsible for the accuracy or applicability of the data therein.

1.2 DEFINITIONS

A. Casing: Steel cylinder used to resist earth and water pressures, to serve as concrete form, and to protect personnel.

B. Dry Method: A method of pier installation in which concrete is placed in the dry. Casing may or may not be used to maintain sidewall stability.

C. Owner's Representative: The Architect, Structural Engineer, or Geotechnical Engineer authorized to act on behalf of the Owner.

D. Owner's Representative - Geotechnical Engineer: The Geotechnical Engineer specifically authorized to carry out the responsibilities defined in this specification.

E. Probe hole: A 1.6 to 2.5 inch diameter hole usually drilled by air percussion methods to a required depth below the pier bottom. The Geotechnical Engineer feels the probe hole by lowering and raising a hooked rod. The size and amount of seams found enables the determination of the soundness of the subsurface formation.

F. Slurry Displacement Method: Method of drilling and concreting in which controlled slurry consisting of water, with or without additives such as bentonite, attapulgite, or polymer, is used to stabilize the hole. The slurry may be used either to maintain the stability of the uncased drilled pier hole or to allow concrete placement when water seepage into a drilled pier hole is too severe to permit concreting in the dry or both.

G. Tremie method: Procedure for placing concrete under water or slurry using a watertight steel pipe or tube to place concrete without washing out cement

fines.

1.3 STANDARDS

A. The following Standards are listed in this specification:

ASTM A36 Steel	Standard Specification for Carbon Structural
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A929	Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Specification for Ready Mixed Concrete
ASTM C150	Specification for Portland Cement
ASTM D1143	Standard Test Method for Piles Under Static Axial Compressive Load
ASTM D4380	Standard Test Method for Density of Bentonitic Slurries
ASTM D4381	Standard Test Method for Sand Content by Volume of Bentonitic Slurries
ASTM D4972	Standard Test Method for pH of Soils

1.4 SCOPE OF WORK

A. The Drilling Contractor shall furnish all labor, materials, services, equipment (including temporary casings and/or dewatering where required), and shall install all piers at the locations and depths shown on the drawings or as otherwise directed by the Owner's Geotechnical Engineer. Installation methods compatible with the design may be used if acceptable to the Owner's Geotechnical Engineer. Methods that are not compatible with the design shall be excluded from consideration.

B. The Drilling Contractor shall furnish and place all reinforcing steel, dowels, and anchor bolts that are shown on the drawings to be embedded in the pier.

C. The Drilling Contractor shall furnish all materials and labor as required to perform the load tests as specified herein and on the drawings.

D. The General Contractor shall provide all necessary excavation, sheeting and bracing or other adequate maintenance of excavation banks, suitable runways and ramps as necessary for access of pier drilling, control of ground and surface water as necessary to keep the work area sufficiently dry, suitable access roads for movement of equipment and materials to and from pier locations, field layout required for pier work including setting and maintaining

a location stake for each pier and giving cut-off grades on all piers, removal and replacement of all overhead and underground obstructions as required, and coordination of all concrete ordering and delivery.

1.5 QUALIFICATIONS

A. Drilled piers shall be installed by a specialty Drilling Contractor with suitable equipment, competent personnel, and a reputation of satisfactorily performing the work. The Contractor shall have a minimum of 5 years successful experience and a minimum of 5 successful installations on projects of a similar size and scope to this project and of using similar installation methods as may be anticipated for this project. Evidence of compliance with this section shall be submitted to the Architect/Engineer prior to entering into a contract for the work.

1.6 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards: The Drilling Contractor shall comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301 - "Specifications for Structural Concrete for Buildings".

2. ACI 117 - “Specifications for Tolerances for Concrete Construction and Materials."

3. ACI 318 - "Building Code Requirements for Reinforced Concrete".

4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

5. ANSI/AWS D1.1 "Structural Welding Code - Steel".

6. ANSI/AWS D1.4 "Structural Welding Code – Reinforcing Steel".

7. ACI 336.1“Standard Specifications for the Construction of Drilled Piers.”

In addition, all applicable building code and local regulations shall be followed. In case of conflict, the strictest interpretation shall govern.

B. Survey Work:

1. The General Contractor shall employ a qualified and licensed professional engineer/land surveyor to perform all surveys, layouts and measurements for drilled pier work including the layout of anchor

rods and/or reinforcing steel dowels embedded in drilled piers. The surveyor shall conduct the layout work for each drilled pier to the lines and levels required prior to beginning excavation and shall make actual in-place measurements of each drilled pier plan location, shaft diameter, bottom and top elevations and deviations from specified tolerances.

2. The surveyor shall record and submit all information pertinent to each drilled pier and cooperate with other testing and inspection personnel to provide data for all required reports.

C. Testing Laboratory Requirements: The Drilling Contractor shall cooperate with all testing and inspection personnel employed to perform field quality control tests and inspections. See Testing Laboratory section of the specifications for required tests and inspections to be performed by the Testing Laboratory and Geotechnical Engineer.

Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

1.7 JOB CONDITIONS

A. Site Information:

1. Data on indicated subsurface conditions are not intended as representations or warranties of continuity of such conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. The data are made available for convenience of the Contractor.

2. The Contractor may make additional test borings and other exploratory operations at no additional cost to the Owner.

3. The Contractor shall inspect the site prior to drilling operations and shall determine any constraints to the work presented by the existing surface conditions and report them to the Owner's Representative.

B. Protection of Existing Structures: Locate all existing underground structures and utilities that are to remain in service during construction. Protect above-ground structures, underground utilities and other construction from damage caused by drilling operations. Report any conflicts between drilling work and underground utilities and structures to the Owner's Representative and do not proceed with the work until the conflict is resolved.

C. Survey of Existing Structures: Record and report to Architect/Engineer surveyed elevation benchmarks on structures where directed by the Owner's Representative before commencing work, when structures are adjacent to

drilling operations. Record and report elevation of each benchmark at least twice a day while drilling is in progress. Should benchmark readings indicate displacement, halt drilling operations until corrective action has been provided and is acceptable to the Owner's Representative and the Owner.

1.8 PREINSTALLATION CONFERENCE

A. At least 7 days prior to beginning pier installation, the Contractor shall conduct a meeting to review the proposed excavation, inspection, and concrete and reinforcement placement methods and procedures to produce pier construction of the required quality. Also review requirements for submittals, status of coordinating work and availability of materials. Establish work progress schedule, materials testing, and certifications. The Contractor shall send a pre- installation conference agenda to all attendees 7 days prior to the scheduled date of the conference.

B. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to thefollowing:

Contractor's Superintendent
Laboratory responsible for field
material testing Drilling
Subcontractor
Ready-Mix Concrete
Producer
Geotechnical
Engineer
Owner's and Architect's/Engineer's Representative

C. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

Owner's
Representative
Architect
Structural Engineer-of-Record

D. The Engineer shall be present at the conference. The Contractor shall notify the Structural Engineer at least 7 days prior to the scheduled date of the conference.

1.9 SUBMITTALS

A. Concrete Mix Design: Submit concrete mix designs suitable for method of concrete placement for Engineer and Owner's Testing Laboratory approval

prior to pier installation.

B. Drilling Records: The Contractor and the Owner's Geotechnical Engineer or other authorized inspector shall each submit copies of the drilling record for each pier to the Architect/Engineer immediately after drilling. The reports shall indicate the name of the job, name of Contractor, and name of drilling superintendent. For each pier installed, the report shall indicate the following information:

1. Pier number and location
2. Pier shaft diameter
3. Bottom elevation
4. Top elevation
5. Pier length
6. Theoretical volume of concrete in pier
7. Actual volume of concrete placed
8. Reinforcing steel size and depth actually placed
9. Drilling start and finish time
10. Concreting start and finish time
11. Variation from specified tolerances including surveyed location and plumbness
12. Construction method (dry method, casing method, or slurry displacement method)
13. Groundwater conditions (rate of water infiltration and depth of water in hole prior to concreting for dry piers; water elevation in hole for wet piers)
14. Elevation of top and bottom of any casing left in place
15. Description of temporary or permanent casing (including purpose, diameter, wall thickness and length)
16. Description and elevation of any obstructions encountered and whether removal was obtained
17. Description of pier bottom including amount and extent of loose

material

18. Method of concrete placement

19. Any difficulties encountered in drilling or concreting operations

20. Any deviations from specifications.

Reports prepared by the Owner's Geotechnical Engineer or authorized inspector shall be compiled and signed by a licensed professional engineer in the state where the project is located. Reports prepared by the Contractor shall be compiled and signed by the drilling superintendent.

C. Shop Drawings:

1. Reinforcing Steel: Submit shop drawings for all drilled pier and pier cap reinforcing steel.

2. Installation Method: Submit detailed procedures of the installation method, including (where applicable) type and number of drilling rigs and equipment, casing size and length, casing removal method, drilling fluid type, dewatering method, concrete placement, and reinforcing steel securing and placement.

3. Steel Casings: Submit shop drawings for size, wall thickness, length, and grade of permanent steel casings required. Show all splices and methods of splicing.

D. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items.

E. Qualification Data:

1. Submit qualification data for firms and persons specified in the article entitled “Qualifications” to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

2. Submit Welding Procedure Specifications (WPS) in accordance with ANSI/AWS D1.1 for all welded joints in steel casing. Submit test reports showing successful passage of qualification tests for all non-prequalified WPSs.

3. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests as specified in section 1.05-B. If recertification of welders is required, retesting will be at Contractor's responsibility.

F. Alternates: The Drilling Contractor shall submit his bid based on the specifications as written without exceptions. He may submit bids for alternates to the specifications or modifications to the design, load test program, or installation specifications for consideration by the Owner's Representative and the Owner.

G. Post Construction Survey: After completion of pier placement, the Contractor shall provide the Owner's Representative with an as-built survey showing the actual locations of the piers at the top elevations. This survey shall show the plumbness of vertical piers, and all abandoned piers and their replacements. No construction of superstructures shall commence until this survey has been reviewed and accepted by the Owner's Representative. In order to facilitate the progress of the Work, the Contractor shall submit partial pier surveys for approval as the Work proceeds.

PART 2 - PRODUCTS

2.1 CONCRETE

Concrete shall be as specified in the "Cast-in-Place Concrete" section of the specifications, in the general notes, and on the drawings, with the additional requirements specified below:

A. Maximum Aggregate Size: Provide maximum aggregate size of three quarters of minimum clear spacing between individual reinforcing bars or bundles of bars, with 1 1/2" maximum.

B. Water Reducing Admixtures: Where required by mix design, use water-reducing admixtures in strict compliance with manufacturers directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete may be used at contractor's option. Use admixtures in the amounts as recommended by manufacturer for climatic conditions prevailing at time of placing concrete. Adjust quantities of admixtures as required to maintain quality control.

C. Slump Limits: Proportion concrete to have a slump that is suitable for the placement process used. The mix must remain fluid throughout the concrete placement time and during extraction of any temporary casing. Provide a minimum 6" slump concrete with retarder for temporarily cased piers at time of pulling casing.

2.2 REINFORCING STEEL

A. See "Concrete Reinforcing Steel" section of the specifications.

B. Reinforcing Support and Positioning Devices: Devices made of non-corrosive

material that support and align reinforcing steel within the shaft and that provide the appropriate side and bottom cover to the reinforcing steel. Acceptable manufacturers include:

"Pieresearch"
"Aztec, a Dayton-Superior Company"
"Foundation Technologies, Inc."

2.3 STEEL CASING

A. Steel casing shall conform to ASTM A 283, Grade C or ASTM A 36.

B. Corrugated steel casing shall conform to ASTM A 929.

2.4 GROUT

A. Grout used for filling annular void outside permanent casings shall be sand cement grout consisting of Portland cement (ASTM C 150 Type I or III), sand (ASTM C 33), and water. Proportions by weight shall be one part cement, 2 1/4 to 2 1/2 parts sand, and the minimum amount of water required to obtain a workable mix but not exceeding a water- cement ratio of 1.0. The grout mix shall be suitable for the method of installation, whether by gravity feed of by pumping under pressure.

2.5 CONCRETE MIXING

A. Ready Mix Concrete: Comply with the requirements of ASTM C94.

B. Hot Weather Concreting: The maximum acceptable concrete temperature at the truck discharge point shall be 95°F. Refer to Hot Weather Concreting Practices specified in "Cast-in-Place Concrete" section of the specifications for required hot weather concreting practices.

C. Cold Weather Concreting Practices: Refer to the "Cast-in-Place Concrete" section of the specifications for cold weather concreting practices and the conditions under which they are to be followed.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Requirements:

1. Excavate holes for drilled piers to dimensions and required bearing strata or elevations as shown on the drawings unless directed otherwise in the field by the Owner's Geotechnical Engineer.

2. Maintain sidewall stability during drilling. If sidewall instability is encountered that the Owner's Representative considers excessive, the Contractor shall use alternate drilling methods such as temporary casing or slurry displacement method.

3. Excavate holes for closely spaced piers and those occurring in fragile or sand stratas only after adjacent holes are filled with concrete and allowed to set a minimum of 6 hours or longer as required for concrete to harden unless temporary casing to maintain sidewall stability is used.

4. Drilled pier design dimensions and depths shown on the drawings shall be considered minimums and are based on bearing and/or friction in assumed strata. If bearing stratum is not capable of maintaining the assumed capacity, the foundation system shall be revised as directed by the Owner's Geotechnical Engineer and Owner's Representative. Revisions will be paid for in accordance with contract conditions relative to changes in the work. Refer to drawings for design bearing pressures, skin friction values, or pier load capacity.

5. Remove loose material and free water from the bottom of the shaft. The surface should be essentially flat or with one step that is less than one-quarter of the diameter of the bearing area.

B. Equipment:

1. Provide adequate equipment so work is expedited to the fullest extent possible. Use equipment fully capable of excavating shafts to depths, diameters, and sizes indicated, and within the specified tolerances. Maintain equipment in satisfactory operating condition and provide sufficient quantity of equipment to maintain the projected schedule of the Work.

2. Using bits or augers with a power-driven rotary-type rig, a shaft of a diameter specified on the drawings shall be excavated from the ground surface to a depth as specified on the drawings or as ordered by the Owner's Geotechnical Engineer.

C. Obstructions:

1. If rocks, boulders, or other unforeseen obstructions are encountered which cannot be removed by standard drilled pier excavation methods, and if such obstructions are not indicated by available sub-surface data, removal of such obstructions will be paid for in accordance with the terms of the Contract relative to changes in the Work.

2. Remove such obstructions by hand labor using air-powered tools or by other safe methods recognized in the construction industry. Standard drilled pier excavation methods include the use of core barrels with pier drilling equipment.

3. The work of this Section includes demolition and removal of rock, boulders, concrete, masonry, and other subsurface obstructions that are indicated by the Contract Documents, or by the available subsurface exploration data, and such work will not be considered a change in the Work.

D. Overexcavation: No payment will be made for extra length or greater diameter of drilled piers when they are installed to a greater depth or are larger than required unless authorized by the Owner's Geotechnical Engineer. Overexcavated drilled piers will be measured and paid for in accordance with the original design or authorized design depth and diameter.

E. Excavated Material:

1. Deposit and spread excavated material on site observing proper placement and compaction requirements.

2. Remove excavated material and dispose of it off site.

3.2 DEWATERING

A. Provide and maintain pumping equipment to keep excavations free of water before placing concrete. An excavation is considered dry if the water rises at a rate of less than 1/4 inch per minute and the height of water at the bottom of the pier does not exceed two inches at the time of concrete placement.

B. Dewater in a manner that will not create subsidence or ground loss that might adversely affect the Work or existing adjacent structures. Should the dewatering system employed involve pumping inside the pier, extreme caution shall be used to prevent an unbalanced water head from causing a "blowout", bottom heave, or "quick" condition that could disturb the proposed bearing stratum or surrounding soil strata.

C. The dewatering method shall be submitted for review and approval of the Owner's Geotechnical Engineer.

D. Conduct water to general site run-off ditches and disposal areas with discharge lines. Provide ditching as required to conduct water to site drainage facilities.

E. If excessive water and/or sidewall instability is encountered and drilling operations must be halted, consult with Geotechnical Engineer and Owner’s Representative before using alternate methods of construction.

3.3 TEMPORARY STEEL CASINGS

A. Requirements:

1. Provide temporary casing at locations as directed by the Geotechnical Engineer where the soil will not stand without support or where sloughing of the sides of shafts may seriously delay or endanger the satisfactory completion of excavation and placement of concrete. Also provide temporary casing at locations as directed by the Geotechnical Engineer to seal off the inflow of water into the excavation.

2. The Contractor shall have immediately available for use on the job an ample supply of casing for each size that will be required for use in the shafts and shall provide additional amounts, as required, to ensure the orderly progress of the job.

3. Such casing may be in short pieces but with jointing devices of sufficient strength that assembled sections of casing may be pulled complete as concrete is placed, or immediately thereafter. Provide casing of sufficient strength to withstand handling stresses, concrete pressure, and surrounding earth and/or fluid pressures. Make diameter of excavation in relation to diameter of casing such as to create a minimum of void space outside of casing. Provide casing with a minimum outside diameter equal to normal outside diameter of drilled foundations.

B. Delivery, Handling, and Storage of Casing

1. Deliver casing to site in undamaged condition.

2. Handle and protect casing to maintain diameter within plus or minus two percent.

C. Casing Withdrawal: Unless otherwise approved by the Owner's Representative, all temporary casing shall be removed from shafts as concrete is placed or immediately thereafter, and in such a manner as to prevent sloughing material from dropping to the bottoms of shafts or falling on top of freshly placed concrete. Casings shall be pulled in a single continuous smooth operation without sudden jerks or impact. Maintain head of concrete above the bottom of the casing that exceeds the soil and water pressure at all times during casing withdrawal. Do not vibrate concrete internally before the casing is withdrawn. A vibratory casing extractor may be used. Do not withdraw casing after the concrete has attained initial set. The casing withdrawal and concreting operations shall be observed by the Geotechnical Engineer.

3.4 REINFORCING STEEL PLACEMENT

A. Before placing, clean reinforcing steel and dowels of loose rust, scale, dirt, grease and other material that could reduce or destroy bond.

B. Fabricate and erect reinforcing cages in shafts as one continuous unit using inner ring reinforcing guide. Place reinforcement accurately and symmetrically about axis of hole and hold securely in position during concrete placement. The Contractor shall verify depths of drilled piers prior to cutting and tying reinforcing steel cages. Reinforcing steel shall be delivered to the site in standard 60-foot lengths and cut as required. Splice no more than 33% of the bars at any one location, alternating spliced and unspliced bars in a symmetrical pattern. Splices shall be 40 bar diameter compression splices for bars #11 and smaller and mechanical end bearing compression splices for #14 and #18 bars unless noted otherwise on the drawings. See drawings for additional splice information. The Contractor shall be responsible for adding additional reinforcing steel ties or spirals as required to ensure stability of cage and maintenance of shape and configuration as required for proper lifting, handling, and placement.

C. Provide cover to reinforcing steel of not less than 3 inches where exposed to soil and not less than 4 inches in temporarily cased piers. Provide spacer devices to maintain side and bottom cover. Devices shall be installed in accordance with manufacturer's instructions.

D. Permissible reinforcing steel upward vertical movement during casing withdrawal shall be no greater than 6 inches. Downward movement should not exceed 6 inches for every 20 feet of shaft length.

E. Use templates to set anchor bolts, leveling plates and other accessories furnished under work of other sections. A qualified and licensed Engineer/Land Surveyor shall determine the plan location and elevation of such devices. Provide spacers (capable of sliding on any temporary casings required), blocking and holding devices to maintain required position during concrete placement.

F. The General Contractor shall protect exposed ends of dowels and anchor bolts from mechanical damage and exposure to weather by wrapping and taping with polyethylene or other suitable material.

3.5 CONCRETE PLACEMENT

A. General:

1. Fill drilled piers with concrete immediately after inspection and approval by the Geotechnical Engineer or other authorized inspector. Use protection sheets (cut out to receive concrete) over excavation openings, extending at least 12" beyond edge. Complete the excavation and concrete placement in uncased excavations before the end of the

workday unless the Architect/Engineer and Geotechnical Engineer grants permission to do otherwise in writing.

2. Place concrete continuously and in a smooth flow without segregating the mixed materials.

3. Place concrete by means of bottom discharge bucket, flexible drop chute, elephant trunk hopper, concrete pump, or tremie. Free fall of concrete may be used if provided for in concrete mix design and provided it is directed through a hopper or chute such that fall is down center of shaft without hitting sides or reinforcing steel. Free fall of concrete is not permitted for depths greater than 10 feet.

4. Place concrete in-the-dry if at all possible. If water occurs, and it is impracticable to dewater drilled pier excavation, and reasonable attempts to seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method or by concrete pumping. Other methods of depositing concrete underwater may only be used if approved by Architect/Engineer.

5. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured, rough finish. Where cut-off elevation is above ground elevation, form top section above grade and extend shaft to required elevation.

6. Provide mechanical vibration for consolidation of at least top 5' of each shaft but only after any temporary casing is pulled or when casing is permanent.

7. Interrupted placing operations of over one hour duration will require a cold joint installation as follows. Leave resulting shaft surface approximately level. At resumption of concrete placing, clean off surface laitance, roughen as required, and slush with a 1-to-1 cement grout or commercial bonding agent before remainder of concrete is placed. Intentional cold joints will not be permitted.

8. Concrete shall not be placed in adjacent drilled piers located within three center- to-center shaft diameters of each other until concrete has cured a minimum of 6 hours.

9. Aluminum pipe or equipment shall not be used for placing concrete.

B. Tremie Method:

1. The drilled shafts shall be filled with concrete by the use of a tremie or concrete pump, sealed at the bottom, extending from above the ground surface to the bottom of the drilled shaft. Inspection of the empty

tremie on the bottom may be requested of the Contractor by the Owner's authorized inspector. With the sealed tremie on the bottom of the shaft, the tube shall be filled to the top extending above the ground. The filled tremie shall be picked up approximately one (1) foot off the bottom of the shaft to allow the weight of the concrete to displace the seal at the bottom of the tremie. At no time is the tremie to be pulled to such a height as to clear the surface of the concrete already placed in the shaft. All concrete shall be poured through the now open tremie with care taken to maintain a sufficient head of concrete to completely displace all water and suspended cuttings of material and to provide sufficient pressure so as to prevent reduction in pile diameter by earth pressure on the fresh concrete. The concrete in each pile shall be carried above cut-off elevation and then dipped out while fresh to cut-off elevation.

2. All concrete shall be deposited through the tremie or pumpline so as to provide a continuous flow, without aggregate segregation, from bottom to top of pile. The production and delivery of the ready-mixed concrete shall be such that not more than 45 minutes shall elapse between the depositing of successive batches of concrete to ensure a monolithic unit of concrete. No deviation from this method will be acceptable.

3. Should the surface of the concrete in the shaft be breached by the tremie or pumpline, the tube shall immediately be withdrawn from the hole, re-sealed and re-lowered below the surface of the concrete, and pouring operations re-started. Should the Owner's authorized inspector deem it necessary, the Contractor shall instead retrieve the reinforcing steel cage, redrill the shaft to reopen the hole, and begin the concreting operations from the bottom of the pier shaft.

4. If the Owner's authorized inspector has reason to suspect that the concrete was breached by the tremie or pumpline or that the pier, for any other reason, may contain extraneous material or otherwise fail the specifications, he may order the pier cored for inspection and/or testing. If the core recovery and/or test results indicate non-compliance with the specifications, the Contractor shall bear the expense of the investigation and/or testing and shall also, at no cost to the Owner, install proper additional construction as required by the Architect/Engineer. Should the investigation and/or testing indicate compliance with the specifications the Owner shall bear the cost of such investigation and/or testing.

C. Hot and Cold Weather Placement: Refer to Part II.

3.6 SLURRY DISPLACEMENT METHOD

A. General:

1. The slurry displacement method of construction may be employed only if approved by the Geotechnical Engineer. The excavation shall be carried to final depth with the hole stabilized using drilling fluid of a minimum density acceptable to the Geotechnical Engineer. The drilling fluid may be reused, but it shall be treated, if necessary, to remove the granular material that is in suspension. Care shall be taken in the drilling to avoid caving or sloughing. The bottom of the hole shall be cleaned with a clean-out bucket or other appropriate tool. Type and proposed density of drilling fluid shall be submitted for approval by the Owner's Geotechnical Engineer.

2. Each finished shaft shall consist of a continuous column of concrete extending from the required top elevation to the required bearing surface, having firm contact against the vertical and horizontal surface of the earth surrounding it.

3. Shaft drilling and concrete placement shall be sequenced to prevent damage to adjacent shaft or shaft excavations.

B. Definitions

1. Slurry displacement method (SDM): Drilling, concreting, or drilling and concreting where slurry is used to stabilize the hole. The slurry may be used (a) for the maintenance of the stability of the unlined drilled shaft element; (b) to assist the drilling or insertion of casing as part of the shaft construction; or (c) to allow acceptable concrete placement when water seepage into a drilled shaft is too severe to permit concreting in the "dry."

2. Slurry or drilling fluid - water or prepared drilling mud properly mixed with water. The drilling fluid shall be treated as necessary to conform to the requirements given in Table 1.

3. Mud - pulverized solids used as the basic ingredient for making a water-based slurry.

C. Excavation

1. Shaft excavation shall be to the elevations and to the diameters shown on the Engineer's drawings. Bottom elevations are minimum depths. Shafts may be extended only at the approval of the Geotechnical Engineer.

2. Use methods and equipment for shaft excavation that leave the side of the hole and bottom free of loose material that would prevent intimate contact of the concrete with firm, undisturbed soil or rock. If loose or

unacceptable material is present, reclean the hole to the satisfaction of the Geotechnical Engineer.

3. Use drilling tools and excavation procedures that minimize excessive negative pressure and avoid disturbance of the surrounding material in the excavations. Raise and lower the drilling tool in the hole at a rate that does not swirl the slurry and affect the stability of the hole.

4. At the completion of excavation and again before the start of concrete placement, clean the drilled-shaft bottom with an air-lift or recirculation system or a cleanout bucket equipped with a one-way flap gate that prevents spoils in the bucket from reentering the shaft.

5. For piers designed without end bearing, the accumulated sediment at the bottom of the pier, measured by sounding with a weighted tape just prior to concreting, shall be less than 6 inches. If greater, reclean the hole to the satisfaction of the Geotechnical Engineer.

6. All spoil and excavated materials shall be kept away from each open shaft excavation to avoid contamination of the excavation after final cleanout.

7. Excavated materials shall be stockpiled or disposed of in areas designated by the Owner's representative.

8. Excavated materials temporarily placed at other locations for the convenience of the Contractor will be allowed only with written approval of the Owner's representative and shall finally be removed and placed within designated disposal areas.

D. PROVISIONS FOR OBSERVATION

1. The Contractor shall cooperate with the Owner and design team to ensure the expeditious and safe observation of the shaft excavations.

2. If the Geotechnical Engineer determines that the material at the bottom of any excavation is unsatisfactory, additional excavation or other corrective action shall be made as directed by the Geotechnical Engineer.

3. If additional excavation is required, the shaft bottom shall be drilled again and observed as described above. This procedure shall be repeated until a bearing material is reached that is approved by the Geotechnical Engineer.

E. SLURRY REQUIREMENTS

1. The mud slurry shall consist of a stable colloidal suspension of pulverized solids thoroughly mixed with water so that the properties specified in Table 1 are maintained. Attapulgite and bentonite shall meet API Specification 13A, Section 3, "Oil-Well Drilling-Fluid Material" dated March 1981. The type of mud used will depend on the subsurface conditions and mixing water character. The water used to mix the slurry shall be clean, drinkable, fresh water, obtained from sources approved by the Owner's Representative. Any physical or chemical treatment to the water or slurry that is considered necessary to have the slurry meet the specifications is the responsibility of the drilled shaft contractor. A written certificate shall be supplied to the Architect/Engineer by the mud supplier specifying the quality and yield for each shipment of mud received. A test report from the supplier giving the physical and chemical properties of the mud shall be supplied to the Architect/Engineer at the start of the work.

2. Water may be used in place of mixed mud slurry, subject to the approval of the Geotechnical Engineer on a pier-by-pier basis except for end bearing piers.

3. For shafts with endbearing greater than or equal to 25% of the total allowable capacity as shown on the structural drawings, the mud slurry sand content shall be limited to 4%.

4. The mud slurry shall be mixed in mud tanks on-site or arrive at the site premixed. The mud slurry shall be mixed, stored, and transported using equipment made for these purposes. Combining or mixing slurry in the shaft shall be not permitted.

5. The in-hole slurry shall meet the specifications prior to concreting. Replace or clean, recirculate, and remove sand from, the slurry to maintain the required slurry properties. Recycling of slurry is permitted provided that the recycled slurry satisfies the specified requirements. Submit to the Owner’s Representative a written record of test results for each drilled pier.

6. The Contractor shall perform testing of the slurry according to the test methods prescribed in Table 1 and shall record the results for quality control purposes. Provide all field test equipment as required. The drilled-pier contractor shall have available at the site a slurry sampler capable of obtaining slurry samples at any depth within the drilled pier excavation. Slurry shall be sampled and tested in the mud tank and from samples recovered within 1 ft. from the bottom of each drilled shaft.

TABLE 1

SLURRY SPECIFICATIONS

Item to be Measured	Range of Results at 20°C	Test Method
Density, (pcf)** For slurry 1 ft from pier bottom		ASTM D 4380 (Mud Balance)
Mineral Slurries		
a. No end bearing	85 Max.	
b. With end bearing	70 Max.	
Polymer Slurry	64 Max.	
Marsh Funnel Viscosity, (sec./qt)		API-RP13B-1* Section 2
a. Mineral Slurry	25 to 60	(Marsh funnel & CUP)
b. Polymer Slurry	40 to 90	
Sand Content by Volume (%), before concreting, for slurry 1 ft screen set) from pier bottom		ASTM D 4381 (Sand
Mineral Slurries		
a. No end bearing	20 Max.	
b. With end bearing	4 Max.	
Polymer Slurry	1 Max.	
pH, during excavation	7 to 12	ASTM D 4972

* Reference Test Method is American Petroleum Institute (API), Spec. 13B, Eighth Edition, April 1980, issued by American Petroleum Institute - Production Department - 211 N. Ervay, Suite 1700, Dallas, Texas 75201.

** The density of the mud slurry shall not be less than what is needed to drill the shaft.

F. Installation Method

1. Where pre-drilled piers are to be installed below the groundwater level or in caving and sloughing soils, and the procedure is approved by the Geotechnical Engineer and the Owner's Representative, use a premixed mud slurry to stabilize the excavation. Maintain the slurry level in the excavation above any unstable zones a sufficient distance to prevent caving or sloughing of those zones but no less than 5 feet above the groundwater level.

2. Set temporary surface casing to contain the slurry, unless waived by the Owner's Representative.

G. Concreting Method

1. Concreting of the drilled pier shall be completed the same day that the excavation is complete. If this is not possible, the excavation will be required to be redrilled, cleaned, and slurry tested before concreting.

2. Place concrete by tremie method or by pumping. Use tremie or pump pipes made of steel and with watertight joints. Use tremie pipe with a minimum diameter of 8 inches or pump pipe with a minimum diameter of 4 inches.

3. Use a capped or pig-plugged tremie or pump pipe inserted and seated in the excavation at the bottom of the pier prior to commencement of the concrete placement.

4. If a capped pipe is used, use tremie or pump pipe with a seal consisting of a bottom plate, or a device acceptable to the Geotechnical Engineer, that seals the bottom of the pipe until the pipe reaches the hole bottom. Place enough concrete in the pipe to prevent the flow of slurry into the tremie pipe when it is lifted off the bottom.

5. If a pig is used, set the open tremie pipe loosely on the bottom. Insert the pig at the top and then place concrete pushing the pig ahead, separating the concrete from the slurry. Take care to ensure that the pig is properly sized to fit in the pipe, and keep the concrete separate from the slurry so that all slurry is expelled from the pipe during the initial charging process. When the pipe is fully filled with concrete, lift the pipe off the bottom the minimum amount needed to start the concrete flowing. Once concrete flow has started, place concrete into tremie at a fast enough rate to maintain a positive head of concrete inside pipe relative to slurry level outside pipe.

6. Embed tremie of pump pipe sufficiently in concrete to maintain seal throughout concrete placement to prevent re-entry of slurry

suspension into the pipe. Provide minimum embedment of 5 feet. If the seal is lost, withdraw pipe, replace the seal, and re-start tremie using a capped tremie or capped pump pipe.

7. Displace out of the pier or remove from the pier the first portion of concrete that comes to the top of the pier that contains concrete contaminated with slurry until acceptable concrete is visible. Add or remove concrete to specified cutoff level.

8. Raise or lower the tremie pipe in an acceptable manner that does not break the seal and does not cause channelization or segregation.

9. Pump the displaced slurry to holding tanks. Do not allow slurry to spill onto or contaminate the site. Do not use excavated slurry pits, unless accepted by the Owner's Representative.

10. Do not use aluminum pipe or equivalent for placing concrete.

11. Measure and report actual volume of concrete placed and theoretical volume versus depth at depth intervals not exceeding the shaft diameter.

3.7 CONSTRUCTION TOLERANCES

A. Plan Location: The tolerance on plan location for the top of the drilled pier shall not be more than 1/24 of the pier diameter or 3" in any direction, whichever is less. If the as- installed shaft is larger than required, the center of the shaft may be taken as the center of a shaft having the required area that lies wholly within the as-installed shaft.

B. Plumbness: Permissible tolerance for plumbness shall be 1.5% of the length. The centers of the top and bottom may be taken as the center of the required area that lies wholly within the as-installed area.

C. Bottom Area: The bottom of the pier shall be essentially horizontal within a tolerance of 1 vertical to 12 horizontal with the area of the bottom bearing not less than 98% of that specified on the drawings.

D. Top Area: The Contractor shall remove excess concrete at the top of the pier beyond the limits of the pier diameter. The pier top diameter shall be the same diameter as the shaft below. Piers extending above the ground surface shall be formed.

E. Concrete Cut-Off Elevation: Concrete cut-off elevation at the pier top shall be plus one inch to minus three inches.

F. Battered Piers: Battered piers shall be installed within 5% of the length from the specified inclination.

G. Anchorage Embedment Tolerance: Vertical and horizontal deviation from design location for individual anchorage components embedded in the pier shall not exceed ± 0.5 inches.

H. If any of the above tolerances are exceeded, the Architect/Engineer shall immediately be notified to evaluate the eccentricity in the pier and recommend corrective measures. The cost of re-engineering and corrective construction shall be borne by the Contractor.

3.8 PERMANENT STEEL CASINGS

A. Requirement: Provide permanent steel casings where shown on the drawings of sufficient strength to withstand handling stresses, concrete pressure, and surrounding earth and/or fluid pressures. Provide casings with minimum outside diameter equal to nominal outside diameter of shaft. Wall thickness shown on the drawings is a minimum required for design purposes. The Contractor is responsible for increasing thickness as required for the installation process.

B. Steel Pipe Casings: Provide steel pipe casings as shown on the drawings delivered in sections of any convenient length. Connect sections by continuous complete penetration welds performed according to AWS standards by certified welders during placement into drilled pier shaft excavation. Splice location and details shall be submitted for approval on steel pipe casing shop drawings.Design bottom edge of lowest casing section to provide cutting shoe for penetrating into rock strata and affecting water seal.

C. Corrugated Steel Casings: Provide corrugated steel casings formed of galvanized or bituminous-coated steel sheets. Corrugated steel casings may be delivered in any convenient section of panel, with sections or panels field connected in accordance with manufacturer's instructions.

D. Installation: Install permanent steel casing as excavation work progresses to ensure stability of drilled pier shaft walls. Remove and replace or repair casings which are damaged during installation and which could impair strength or efficiency of completed drilled pier.

E. Fill the void space between permanent casing and shaft excavation or between permanent liner and temporary casing with fluid grout by means of grout pipe and pump pressure as required to achieve uniform void filling.

3.9 INSPECTIONS AND TESTS FOR DRILLED PIER EXCAVATIONS

A. Verification of Design: Bottom elevations, skin friction capacities and lengths of drilled piers as shown on the drawings are estimated from available subsurface data. Actual elevations, pier lengths, and skin friction capacities

will be determined by the Geotechnical Engineer from conditions found in the excavations.

B. Notification of Architect/Engineer: If field conditions differ from the data and design recommendations outlined in the Geotechnical Report, the Geotechnical Engineer shall notify the Architect/Engineer immediately.

C. Additional Tests: Additional tests may be required by the Geotechnical Engineer to determine new design criteria. Such tests shall be made as quickly as possible so as not to delay the concreting operations any longer than absolutely required.

D. Observation Requirements: Each drilled pier shall be inspected by the authorized inspector and approved prior to placement of concrete.

E. Cooperation with Testing and Inspection Personnel: The Contractor shall provide facilities as required to assist in the inspection and testing of the excavations, and cooperate with the inspecting and testing personnel to expedite the work.

F. Notification of Observer: The Contractor shall notify the authorized observer at least twelve hours prior to the time the excavation will be ready for inspection. Drilled shaft installation shall not proceed without the authorized observer on site.

G. Personnel Safety: The Contractor shall provide gas testing equipment, protective cage, or temporary casing or shoring of proper diameter, length, and thickness, and all other safety equipment required by law for inspection and testing of drilled piers and to protect workmen and inspectors during hand belling or other operations necessitating entry into shaft.

3.10 APPROVAL BY THE GEOTECHNICAL ENGINEER

A. Approval by the Owner's Geotechnical Engineer is required on all pier installation criteria and his decision and judgment on pier length, rejection of piers, additional piers required, and all other pier installation and capacity questions shall be final.

3.11 CONTRACT BASIS

A. Basis of Bids: Bids shall be based on number of drilled piers, design length from top elevation to bottom of shaft and diameter of shaft, as shown on drawings. The bid price shall include cost for temporary casing of excavation that may be required.

B. Basis for Payment: Payment for drilled piers will be made on actual net volume of drilled piers in place and accepted. The actual length and shaft diameter

may vary to coincide with elevation where satisfactory bearing or friction strata is encountered, and with actual bearing value of bearing strata determined by testing services, and with stability and characteristics of soil strata. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts.

1. There will be no additional compensation for excavation, concrete fill, reinforcing, casings, or other costs due to unauthorized overexcavating shafts. Overexcavated piers will be measured and paid for in accordance with required design or authorized depth. No payment will be made for rejected drilled piers.

2. Prices quoted shall include full compensation for labor, temporary casing, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete, and other items for complete installation.

C. Unit Prices: Unit prices for the following items, as set forth in contract conditions, will apply in event additions to or deductions from work are required and authorized by written order from Architect/Engineer to Contractor.

Soil excavation (including temporary casing if required)	per cu. yd.
Soil excavation by slurry method	per cu. yd.
Rock excavation	per cu. yd.
Permanent steel casings, installed	per lin. ft.
Reinforcing steel and dowels, installed	per lb.
Concrete	per cu. yd.

END OF SECTION 31 63 29

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 12 16 – ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 - General Requirements.

B. Section 31 22 00 - Grading.

C. Section 31 23 26 - Base Course.

D. Section 32 13 13 - Site Concrete Work.

1.2 SUMMARY

A. Section includes:
   1. Paving for parking areas and areas between buildings.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer's technical data for materials and products.

1.4 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.5 PROJECT REQUIREMENTS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

1.6 PROJECT CONDITIONS

A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

PART 2 - PRODUCTS

2.1 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.2 HEADERS

A. Concrete: Per specification Section 32 13 13 - Site Concrete Work.

B. Wood:
   1. Redwood, Construction Heart Grade, size 2 by 6, unless otherwise indicated.
   2. Stakes: 2 by 4 redwood or 2 by 3 Douglas fir, Construction Grade.
   3. Nails: Common, galvanized, 12d minimum.

PART 3 - EXECUTION

3.1 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.

C. Where wood headers are indicated on drawing, fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on center with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and anchorage as required to fasten headers in place.

3.2 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.

B. Provide surfacing material over base course as specified in Section 31 23 26 - Base Course.

C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.

D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.

E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.

F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.

G. Placing:
   1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.
   2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.

H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.

I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.

J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.

K. Rolling:
   1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.
   2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.
   3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.
   4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188

3.3 TOLERANCE

A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

C. Premium paving tolerances and requirements for synthetic track:
   1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner's representative.
   2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.
   3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, "bird baths" are evident at a depth more than 1/8 inch repair using the best method of correction.
   4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving.

3.4 TESTING

A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.5 SURFACE SEALING

A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 32 12 36 - Seal for Bituminous Surfacing.

B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.

C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

3.6 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.7 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 13 13 – SITE CONCRETE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – General Requirements

B. Section 03 10 00 – Concrete Forming and Accessories

C. Section 03 20 00 – Concrete Reinforcement

D. Section 03 30 00 – Cast-in-Place Concrete

E. Section 07 92 00 – Joint Sealants

F. Division 23 – HVAC

G. Division 26 - Electrical

H. Section 31 22 00 – Grading

I. Section 31 23 16 – Excavation and Fill for Pavement

J. Section 31 23 19 – Excavation and Fill for Structures

K. Section 31 23 26 – Base Course

L. Section 31 12 16 – Asphalt Paving

M. Section 32 12 16 – Pavement Markings

N. Section 33 11 00 – Site Water Distribution Utilities

O. Section 33 40 00 – Storm Drainage Utilities

1.2 SUMMARY

A. Section includes:
   1. Portland cement concrete pavement, cement walks, curbs, gutters ramps, catch basins, pipe bedding and encasements.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit plans, elevations and details of concrete site Work.

B. Product Data: Submit mix designs and manufacturer's technical data for materials and products. Submit 3-inch by 3-inch concrete Sample of each specified color.

C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

1.4 QUALITY ASSURANCE

A. Comply with the Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:
   1. Concrete: 28-day compressive strength 3,000 psi, unless specified otherwise.
   2. Reinforcing Mesh: ASTM A185, 4 by 4/W1.4 by W1.4 welded wire mesh.
   3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D994.

B. Form Materials:
   1. Side forms: Douglas fir, Construction Grade or Better or metal forms.
   2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES

A. Concrete Pavement: Install Portland cement concrete pavement in compliance with the Standard Specifications for Public Works Construction, Section 302- Roadway Surfacing.

B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed \directly in excavations conforming to the required sizes.

E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six percent and medium broom finish at slopes up to six percent.

3.2 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.3 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 17 19 – PAVEMENT MARKINGS AND WHEEL STOPS

1.1 SUMMARY

A. Section Includes:
   1. Pavement markings.
   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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings, and samples.

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 Traffic paint” manufactured by Ennis Traffic Safety Solutions, 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”.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
   1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
   2. 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 paving specialties and adjacent items.
   3. Install paving specialties using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
   4. 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
   5. Securely attach paving specialties in place to supporting construction.
   6. Installed paving specialties must be warrantable. Do not install, correct, or replace paving specialties in a manner that results in any warranty or guarantee becoming void.

B. Pavement Marking Special Techniques:
   1. Paint the International Symbol of Accessibility on pavement at each accessible parking space, as indicated, in conformance with the requirements of section 1129B.5, part 2, title 24 of CCR Accessibility Regulations. Paint white symbols on blue square backgrounds.
   2. Provide hairpin stripe hatching between accessible parking stalls as indicated.

C. Wheel Stop Special Techniques:
   1. Install over clean, dry surfaces at locations indicated, and in even alignment.

2. If paving surface is uneven, level with a mixture of adhesive and sand before installing wheel stops.
3. Apply adhesive in conformance with the manufacturer's instructions. Provide a bond for at least 75-percent of the contact surface.

D. 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 and from plumb, level, and alignment.

E. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

F. Protection:
1. Protect installed paving specialties in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it's no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 17 26 – 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 SECTION REQUIREMENTS

A. Submittals: Submit product data, shop drawings, and samples.

B. 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.

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.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General:
1. Ensure proper supervision practices are followed at the project site before the installer begins work and at all times during installation.
2. 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 tactile surfacing and adjacent items.
3. Install tactile surfacing using materials and methods required, recommended, or accepted by the manufacturer, along with manufacturer-recommended accessories and techniques.
4. 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
5. Securely attach tactile surfacing in place to supporting construction.
6. 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. 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 and from plumb, level, and alignment.

C. Correction and Repair:
1. Correct deficiencies that do not conform to the Contract Documents.
2. Repair non-conforming, damaged and defective work.
3. Replace soiled items that cannot be cleaned to the same condition as new.

D. Protection:
1. Protect installed tactile surfacing in place from soiling, deterioration, and damage until Substantial Completion.
2. Remove protection when it’s no longer needed and before Substantial Completion.

END OF SECTION

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SECTION 32 84 00 - LANDSCAPE IRRIGATION

PART 1: GENERAL

1.1 REQUIREMENTS

A. Work included in this section: The work shall include all materials, labor, services, transportation, equipment, trenching, laying of pipes and control wires, installation of valves, sprinkler heads, etc., backfill, testing, adjustments, and record drawings so that the finished system is complete in every respect and shall be ready for operation satisfactory to the County.

B. The requirements of the General Conditions, Supplementary General Conditions, and Division 1 apply to this section.

C. Related work not included in this section:
Grading
Landscape planting
Water service to supply points
Electrical (115 volts only for Controller)
Appenix, Protection of Trees

1.2 SHOP DRAWINGS SUBMITTALS

A. Section 01000 – General Requirements and Submittal List

1. Product Data: Indicate materials, construction, configuration, dimensions, and finishes.
2. Assurance/Control Submittals:
Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.

B. Equipment or materials installed or furnished without prior approval of the County Engineer may be rejected and the Contractor may be required to remove such materials from the site at their own expense.

1.3 INTENT OF SPECIFICATIONS

A. It is the intention of these specifications to install an irrigation system free from defects in materials and workmanship.

B. In the event of any discrepancies between the plans and the Specifications, the final decision to be followed shall be made by the County Engineer.

1.4 SCOPE OF WORK

A. The work included in these specifications shall consist of furnishing all labor, tools, materials, appliances, tests, permits, taxes, etc., necessary for the installation of a landscape irrigation system, and the removal of all debris legally from the site.

B. The system shall irrigate all areas and shall be left ready for operation to the satisfaction of the County Engineer.

C. Workmanship shall be first class, competent, and to the satisfaction of the County Engineer.

1.5 GENERAL REQUIREMENTS

A. All local, municipal and state laws, rules and regulations governing any portion of this work shall be made a part of these specifications and their provisions carried out. However, when specifications or drawings describe materials, workmanship or construction of better quality, or larger size, it shall take precedence over the rules and regulations.

B. Before submitting a bid, each bidder shall carefully examine the irrigation drawings and specifications. Contractors shall visit the site and note all existing conditions and limitations applying to the work and include in bid, a sum sufficient to cover the cost of all items.

C. If the Contractor wishes to substitute a product that is believed to be equal and meets all the mechanical, material, and operational requirements of the products as specified, contractor shall submit a letter stating, (1) the qualifications of the substituted product, (2) reasons for requesting the substitution, (3) the credit the Contractor will offer to the County if such substitution be formally accepted as an equal.

D. The Contractor shall be responsible to cover all pipe openings, valves, etc., before and after being set in place to prevent obstructions in the pipe and valves.

E. The Contractor shall provide all temporary storerooms and shops at the site for safe and proper storage of his materials, tools, etc. These rooms shall be constructed only in locations approved by the County and shall in no way interfere with the work of any other contractor. When these rooms interfere with any installation, it shall be removed and/or relocated by the Contractor at contractor's expense after having been notified by the County Engineer that such removal is necessary.

F. Any existing buildings, equipment, piping, oil lines, pipe coverings, sewers, sidewalks, landscaping, etc., damaged during the course of the work shall be replaced or repaired in a manner satisfactory to the County Engineer and at the Contractor's own expense, and before final payment will be made.

G. The Contractor shall be responsible for damages to the grounds, walks, roads, building, piping systems, electrical systems and their equipment and contents caused by leaks being installed or having been installed. Contractor shall repair, at own expense, all damage so caused. All repair work shall be done in a manner satisfactory to the County Engineer.

1.6 GUARANTEE

A. The entire irrigation system, done under this Contract, shall be guaranteed against all defects and faults or material and workmanship, and sustain in working order for one (1) year from date of completion without expense to the County Engineer.

B. Materials used shall carry a minimum one (1) year manufacturer's guarantee over and above Contractor's guarantee.

C. If, during guarantee period, settlement occurs and adjustments in pipes, valves and sprinkler heads, planting areas or paving are necessary to bring the system to the proper level of the permanent grades, the Irrigation Contractor shall make all adjustments without extra cost to the County Engineer.

D. After the system has been completed, the Contractor shall instruct the County in the operation and maintenance of the system. Contractor shall coordinate all training between the product manufacturer representatives and the County maintenance personnel.

E. In the event the Contractor does not respond to the County's request for repair work under this guarantee within a period of 48 hours, the County may make such repairs as he may deem necessary at the full expense of the Contractor.

PART 2: MATERIALS

All materials shall be new and of size and type as called out on the drawings. All materials of like-kind shall be of one manufacturer. Materials or equipment installed or furnished that do not meet the Landscape Architect's, County's or governing agencies standards will be rejected and shall be removed from the site at no expense to the County

2.1 LIST OF MATERIALS FOR APPROVAL

A. Within 20 days after award of contract, the Contractor shall submit to the County Engineer for approval, four (4) copies of a complete materials list, together with manufacturers' name and numbers covering all material to be furnished under this contract. Contractor shall also furnish 4 copies of descriptive literature with catalog cuts marked with highlighter pen on all items to be used on this project. Digital submittals are preferred, and equipment shall still be marked with highlighter to indicate the specific equipment being ordered. No work shall be commenced before receipt of approved material list and descriptive material. List shall cover items listed below and all items indicated on drawings:

Red brass pipe and fittings
Pipe compound
Plastic pipe & fittings
Plastic pipe primer & solvent
Threaded plastic pipe
Teflon tape
Control wire & connectors
Valve operating wrenches
Pressure Regulator
Master Valve
Flow Sensor
Shut-off / isolation valves
Valve boxes
Controllers & Controller Accessories
Remote control valves
Quick coupling valves & couplers
Sprinkler heads
Rotors
Nozzles / Bubblers
Dripline and Dripline Fittings

2.2 SHUT-OFF VALVES

Except when a part of the backflow preventer, ½" through 2" shall be 200 lb. WOG bronze gate valves, non-rising stem, hand wheel, Teflon impregnated packing gland, solid wedge disc.

2.3 VALVE BOXES FOR MAIN SHUT-OFF VALVES

Valve boxes for main shut-off valves shall be of size and type as called out on the

drawings.

2.4 MAINLINE

A. Pressure main line piping for sizes 2" – 3" shall be PVC Class 315 with sovent primer and welded joints.

B. Pressure main line piping for sizes 1" – 1.5" shall be PVC Schedule 40 with sovent primer and welded joints.

2.5 PIPE AND FITTINGS – RED BRASS

Red brass pipe shall be Federal Specification Number WWP-351, medium weight, IPS, with threads to conform to ASA Specification B2.

2.6 PIPE COMPOUND

Pipe compound shall be pure approved type for metal to metal joints.

2.7 DI-ELECTRIC ISOLATION

Di-electric isolation shall be provided between all connections joining ferrous and non-ferrous metals, or old (existing) ferrous and new ferrous metals. Submit, for approval, type intended for use.

2.8 SOLVENT WELDED PLASTIC PIPE

A. All PVC pipe shall be permanently and continuously marked with manufacturer's name, pipe size (IPS) Class or Schedule, SDR number (Class-pipe only), ASTM (D-2241-69 for Class pipe and D-1785-68 for Schedule pipe), manufacturer's lot number and NSF approval. Pipe with dents, wrinkles, die or heat marks is not acceptable. Pipe shall be delivered to the site in 20-foot lengths.

B. Schedule 40 PVC plastic pipe shall be used for pipe sizes up to and including 2 inch diameter on both the discharge and supply side of control valves. Class 315 PVC plastic pipe shall be used for pipe sizes from 2.5-inch up to and including 3-inch diameter.

2.10 THREADED PVC NIPPLES

Threaded PVC nipples are to be of Schedule 80, Type 1, 4-inch minimum length, except where detailed otherwise on drawings.

2.11 PVC LATERALS (NON-PRESSURE PIPING)

Laterals shall be 1120/1220 normal impact, schedule 40, solvent-weld type PVC pipe.

2.13 PIPE COMPOUND FOR PVC

Threaded connections, including PVC to steel make-up, shall be best grade Teflon tape.

2.14 PRIMER

Primer for PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe, to be chemically compatible with the pipe, fittings and solvent.

2.15 SOLVENT

Solvent for PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe, to be chemically compatible with the pipe, fittings and primer.

2.16 REMOTE CONTROL VALVES

All remote control valves shall be electrically operated, normally closed, slow closing, 24 VAC 50/60 Hz solenoid actuated globe pattern design, and be installed per the details. The valve body shall be constructed of heavy-duty glass-filled UV-resistant nylon and have stainless steel studs and flange nuts; diaphragm shall be of nylon reinforced nitrile rubber.

2.17 CONTROL WIRE

Control wires to electrically operated solenoid valves shall be direct burial type UF#14 AWG copper, 3/64 inch thick PVC coating. UL approved for Class 2 wiring for 24 volts, 60 cycle AC use UL recognized waterproof connectors to connect control wires to solenoids.

2.18 CONTROL WIRE CONNECTIONS

Control wires to electrically operated solenoid valves shall be direct burial type UF#14 AWG copper, 3/64 inch thick PVC coating. UL approved for Class 2 wiring for 24 volts, 60 cycle AC use UL recognized waterproof connectors to connect control wires to solenoids.

2.19 QUICK COUPLING VALVES AND ASSEMBLIES

Quick couplers shall be 1 inch i.p.s., two piece, brass or bronze construction equipped with a cover, unless otherwise specified on plans. The Contractor shall provide one quick coupler key with hose swivel for each five quick couplers installed. Contractor shall supply a minimum of one quick coupler key with hose swivel, and shall be installed per details.

2.20 VALVE BOXES

Valve boxes shall be concrete with a cast iron locking lid. The cover shall be permanently embossed, "GV" for gate valve, "RCV" for remote control valves, "QC" for quick coupler valves, MV for Master Valves, or FM for Flow Meter. Paint is not acceptable. Contractor shall supply one (1) valve box cover key for each five (5) valve boxes installed. Provide a minimum of two (2) cover keys. Boxes are to be installed per details.

2.21 EMISSION DEVICES: SPRINKLER HEADS, BUBBLERS, DRIPLINE

Irrigation Emitter Devices (Sprinkler heads, bubblers, dripline, etc.) shall conform to make, size, type and performances as called out on the drawings.

2.22 PRESSURE REGULATOR

The system shall be protected with a Pressure Regulator, installed on the inlet side of the backflow preventer. The Pressure Regulator shall conform to make, size, type and performance as called out on the drawings.

2.23 MASTER VALVE

The system shall be protected with the installation and connection of Master Valve, and shall conform to make, size, type and performances as called out on the drawings.

2.24 FLOW SENSOR

The irrigation system shall be protected with the installation and connection of a flow sensor. The make, size, type and performances shall be as called out in the drawings and shall conform to the flow demands of the irrigation system as designed.

2.25 CONTROLLER(S) AND ACCESSORIES

The Irrigation Controller(s) and accessories (including weather station or rain sensors) shall conform to make, size, type and performances as called out on the drawings.

2.26 FLUSH POINT

1. Install one flush point at the lowest point in each dripline station. Install in a valve box.
2. Flush point shall be installed per mfg. recommendations.
3. Flush point as indicated in plan, or approved equal.

PART 3: EXECUTION

3.1 NEW PIPELINE INSTALLATION – GENERAL

A. When pipelines run parallel they shall be separated horizontally by a minimum distance of 12". When pipelines cross each other they shall be separated vertically by a minimum distance of 4".

B. No irrigation trenching shall pass closer than eight feet of the base of any tree. No tree root larger than 2" diameter shall be cut without approval of the County Engineer.

3.2 COVER OVER MAINLINES:

A. Maintain 24 inches of cover over mainlines 2” and smaller in diameter. All trenching shall be per details.

B. Maintain 36 inches of cover over mainlines 2.5” to 3” in diameter. All trenching shall be per details.

3.3 COVER OVER LATERAL LINES:

A. Maintain 12 inches of cover over all lateral lines.

B. Pipe bedding and backfill: bedding shall surround the pipe to two feet above the top of the pipe. Bedding shall be placed in 6 inch lifts. All bedding shall be densified by water jetting. Water jetting shall be sufficient to thoroughly wet bedding material around the pipe. There shall be no rocks over 1/2" in greatest dimension and no organic matter placed in the bedding material. Backfill shall be the material placed above the bedding. Backfill shall be placed in one-foot lifts and densified by water jetting. Jetting shall be continued until backfill collapses and water is forced to the surface. Pipe trenches thoroughly densified by water settling shall have a minimum relative compaction of 85%. There shall be no rocks over 2" in greatest dimension or organic matter in the backfill. Trench areas which exhibit insufficient densification shall be subject to compaction tests as requested by the Contract Administration Inspector or the County Engineer. All such compaction tests shall be at the expense of the Contractor. Additional tests may be required until the 85% minimum compaction is achieved. Finished trenches shall match finish grades flush with adjacent finish grades. The Contractor shall be responsible for maintaining the trenches flush and smooth until final acceptance of the project.

C. The maximum trench width shall be two and a half diameters of the pipe.

3.4 PIPES CROSSING UNDER PAVING:

A. Where irrigation piping crosses a vehicular roadway or other paving having a width of less than 25 feet, a PVC Schedule 40 PVC sleeve which is a minimum of two pipe sizes larger than the piping to pass through it, shall be jacked under the paving at a depth of 36" minimum. Where remote control wiring crosses under paving having a width of less than 25 feet, a 3-inch PVC Schedule 40 PVC sleeve shall be jacked under the paving at a depth of 36" minimum. All sleeves shall extend 3' (3 feet) minimum beyond the edges of paving.

B. Where irrigation piping crosses a vehicular roadway or other paving having a width greater than 25 feet, a trench shall be excavated across the roadway or paving to accommodate a Class 315 PVC sleeve a minimum of two pipe sizes larger than the piping to pass through it, at a depth of 36" below the bottom of the paving, as measured from the top of the sleeve. Where remote control wiring crosses under paving having a width greater than 25 feet, a 3-inch Schedule 40 PVC sleeve shall be installed at a depth of 36" below the bottom of the paving, as measured from the top of the sleeve. The backfill of the trench shall be a 2 sack cement slurry. The slurry shall extend from the bottom of the trench to within one inch of the bottom of the existing paving. The trench in the existing paving shall be repaired with a like paving material and join the existing paving both horizontally and vertically.

3.5 REMOTE CONTROL WIRING UNDER PAVING

Remote control wire under paving shall be placed in a 3" class 315 PVC sleeve buried at a depth of 36. Roadways or paths less than 25 feet in width shall have the sleeve jacked under the roadway.

3.6 FITTINGS ON MAINLINES:

All outlets from a mainline shall be accomplished with line sized tees with an outlet of the specified size. No saddle tees shall be permitted.

3.7 INSTALLATION OF VALVE BOXES

Boxes shall be set flush with finish grades, including sloped areas, and all soil within 12 inches of the perimeter of the box shall be compacted by water settlement as indicated in the trench repair section of this specification. Boxes are to be positioned per details.

3.8 LAYOUT OF PIPING

Pipe layout as shown on irrigation plan is schematic, except where pipe location has been dimensioned. Contractor may route piping in the most expedient manner consistent with the requirements set forth herein, including avoidance of tree roots. This project is likely to contain significant tree roots. Care should be taken not to disturb or damage roots of existing trees. Contractor shall adhere to As-Built requirements as shown below.

3.9 PLACEMENT OF IRRIGATION HEADS

Note: Irrigation plans for spray, rotary spray or rotors are designed, as a minimum standard, for head-to-head coverage. Stream bubblers and rotary nozzles may be designed for pattern to pattern coverage. Head locations shall be scaled from center of head symbol directly from the irrigation plan. Accuracy of placement shall be within plus or minus two feet for all rotary heads having a throw of 25 feet or greater; within plus or minus 8 inches for all head types with a throw of under 25 feet. Where heads are located adjacent to paving, and the paving drains back into a planter, the heads shall be placed within three inches of such paving. Water waste is strictly prohibited by California Law (AB 1881). If spacing demands additional or fewer materials, notify County Engineer before commencing work.

3.10 INSTALLATION OF IRRIGATION HEAD / IRRIGATION EMITTER

A. Install all sprinkler heads with spacing and coverage indicated on the drawings. Coverage should be sufficient to irrigate areas intended to receive supplemental irrigation to support plant growth and health.

B. To insure proper coverage spray heads and rotary heads shall be installed on separate control valves.

C. Install heads and or change heads, nozzles, or orifices as may be required to provide or adjust coverage.

D. Branch lines, swing joints or sprinkler risers shall not be sized smaller than the sprinkler heads inlet they serve.

E. Pop-up Head Installation:
   1. Pop-up head shall be installed flush with finished grade and 9 inches from edge of walks, and 12 inches from buildings to parking areas, or whenever sprays are located adjacent to impervious surfaces.
   2. Install pop-up heads on factory assembled triple-swing joints or triple-swing joints assembled with PVC Schedule 80 nipples and Marlex 90 degree elbows.

F. Dripline shall be installed per manufacturer recommendations.

3.11 TRENCHING

A. Check all grades so that work may proceed, keeping materials at specified depth.

B. Do all excavation for installation of work included in contract. Mechanical trenching machines shall be of approved type to cut trenches with straight sides. Trenches shall be only wide enough to lay the pipe and control wires. Perform minor adjustments to avoid existing utilities as directed without additional cost. "Pulling" of pipe and/or control wires will not be permitted.

C. Existing Trees

   1. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots.
      a. Excavation in areas where two (2) inch and larger roots occur shall be done by hand.
      b. All roots two (2) inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying.
      c. Where a ditching machine is run close to trees having roots smaller than two (2) inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through.
      d. Roots one (1) inch and larger in diameter shall be painted with two coats of Tree Seal, or equal.
      e. Trenches adjacent to tree should be closed within twenty-four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

D. Contractor is responsible for repairs of all damaged plumbing or electrical during construction digging or trenching.

3.12 ASSEMBLY OF PIPES

A. Metal Pipe

Do not bend or spring pipe, make all offsets or changes in direction with fittings. Cut threads with sharp, clean dies to conform to ASA Specification B2. Assemble pipes free from dirt and scale, ream and deburr. Make up joints by applying oil base

compound to male threads only. Remove excessive compound after make-up.

B. PVC Plastic Pipe

1. Handle with care when loading, unloading, transporting and storing material to avoid damage. Store pipe and fittings under cover before using. Transport in vehicle with bed of sufficient length to carry pipe flat and fully supported. Store pipe in same manner. Notify County Representative when each pipe and fittings shipment reaches the site for his or her observation. Rejected materials shall be immediately removed from the site and replaced with new shipment of different batch number.

2. Solvent welding - Use non-synthetic brush to spread primer and solvent using no larger than pint-sized cans. Clean and refill cans each day. Cut pipe square, ream, chamfer outside end at 10 degrees. Clean and dry pipe and fitting socket. Scrub full length of inside socket and pipe end with primer, prime inside socket again. Immediately apply solvent to pipe end and to socket, then again to pipe end. Bottom the pipe in socket and turn 90 degrees. Hold joint together 30 seconds. Wipe off excess solvent. Allow to set 30 minutes before moving. Centerload pipe with small amount of backfill to prevent arching and whipping under pressure, leaving all joints exposed.

3. Threaded connections - Use Teflon tape on plastic threaded joints. Screw hand tight and another half turn by wrench. On PVC to metal pipe, work the metal connection first.

3.13 LAYING OF LINES

A. All lines set in place under paving shall extend 18" minimum beyond edge of paving.

B. Snake PVC plastic pipes side to side in trench bottom keeping 4" horizontal clearance between two pipes in same trench. Do not lay pipe in trench containing water or at less than 32 degrees F. Centerload immediately, leaving joints exposed.

3.14 LAYING OF CONTROL WIRES

Lay wires in common trench with main lines wherever possible. Splicing is allowed with 24" expansion loop only in electrical junction box with bolt down lid. Follow all two-wire controller manufacturer recommendations. All splices shall be waterproof. No trench to be covered before County has inspected wire runs. Any field splices shall be located in separate valve box marked on "As-builts". Field splice boxes shall be of a sufficient size to provide for future maintenance.

3.15 AUTOMATIC CONTROL SYSTEM INSTALLATION

The foundation of the automatic controller shall be per details.

3.16 LOW VOLTAGE WIRE CONNECTIONS

Connectors shall be DBY or DBR as manufactured by 3M Corp., or as recommended by the controller manufacturer. Install all wire connections per controller manufacturer and valve manufacturer recommendations.

3.17 CONTROL WIRE

Mainline control wires shall be taped together at five (5) foot intervals with black electrical tape, then laid parallel to pressure line with 18 inches minimum cover to finish grade.

Control wiring located under paved areas shall be encased in Schedule 40 PVC pipe and shall extend a minimum of 12 inches beyond pavement.

Wires shall be color coded, white for common ground wire, red or black for valve control wires.

Wire splicing shall only be performed in controller cabinet and at remote control valve boxes. Splices shall be made with a mechanical connector equal to "Scotch-lok" and encased in epoxy resin to provide a permanent watertight connection.

Stubbed out control wires shall terminate in yard boxes, and marked “STUB OUT”.

Wire passing under future or existing paving or structures shall be encased in Schedule 40 PVC pipe extending at least 12 inch beyond edges of the paving or structure.

3.18 INSTALLATION OF IRRIGATION CONTROL WIRING

A. Do not tape wire bundles to the mainline piping.

B. The Contractor shall run two extra black control wires from the automatic controller to the farthest valve on the system, or to the farthest valve at each end of the controller area, if the farthest area extends in two directions from the controller.

C. Each exterior controller enclosure shall have a ground rod.

3.19 IRRIGATION SYSTEM FLUSHING AND TESTING

A. The irrigation system shall be flushed in the presence of the Inspector. Flushing shall start with the valve closest to the point of connection and proceed with each consecutive valve toward the valve farthest from the point of connection. Each lateral system shall have each riser capped during the flushing commencing with the riser closest to the valve and proceeding to the farthest riser. After the entire irrigation system has been flushed the system shall be pressure tested in accordance with section 308-5.6 of the SSPWC.

C. The irrigation system mainlines shall be pressure tested following the flushing of the complete system. The mainlines shall be tested for 24 hours at 125 p.s.i. with all control valves in place and closed. During the test, the Contractor shall provide pressure gauges downstream from the backflow device and upstream from the farthest remote control valve in the system.

3.20 PRESSURE TESTS

Perform all hydrostatic tests in presence of the County Representative after flushing lines. Maintain 125 PSI without any pressure drop on main lines for 3 hours with all air expelled from line and with all valves in place. All leaks shall be corrected in mechanical manner without use of epoxy fillers or other filler compounds. Contractor shall provide all equipment for tests including force pump and pressure gauges.

3.21 BACKFILL

After the work has been installed, flushed, tested, and proven tight in the presence of the County Engineer, backfill with fine materials. Allow no rocks or other objects larger than one inch diameter to fall in the first 6" of cover. Backfill in 4" layers and tamp properly to avoid any voids. Flooding of trenches shall be done only with the approval of the County Engineer. However, all sandy soils, as determined by the County Engineer, shall be flooded during the backfill-compaction operation. Compact backfill over lateral lines to equal density of adjoining undisturbed soils, and compact to 90 percent over main lines. All trenches shall be left flush to the adjoining undisturbed grades. All backfill under surfaces to be paved for vehicular use shall be compacted to 95%. Any work covered prior to observations by the County Engineer shall be uncovered at the expense of the Contractor to allow for such observations if demanded by the County Engineer. Any surplus soil shall be distributed on site or properly disposed of off-site as directed by the County Engineer.

3.22 ADJUSTING SYSTEM

Adjust entire system prior to coverage test, and again at conclusion of maintenance period.

A. Set all shut-off valves in the system to full open position.

B. Adjust all stationary heads to uniform coverage on each system using adjusting screws in each sprinkler head and by control of the throttle device on each remote control valve.

C. Adjust arcs of all heads to prevent overspray on areas to be kept dry. Replace nozzles in heads to different arcs, i.e., 180 degrees nozzle to 120 degree nozzle, etc. to provide proper and more adequate coverage. These changes or adjustments shall be made without additional cost.

E. Install check valves to prevent drainage from any sprinkler head.

3.23 COVERAGE TEST

When installation of the sprinkler system is completed, perform a coverage test in the presence of the County Engineer and Landscape Architect to determine that coverage for planting areas is complete and adequate. Where inadequate coverage occurs, or where site conditions require, the Contractor shall provide necessary material and perform work to correct all inadequacies without additional cost.

These tests and corrections shall be accomplished before any ground cover or shrubs are planted.

3.24 RECORD DRAWINGS (AS-BUILTS) AND CONTROLLER CHARTS

A. As built plans shall be maintained daily throughout the construction period and turned over to the County Engineer at the Operational Final Inspection, as indicated in the General section of this Notice to Contractors in the Record Drawings Submittal section.

B. The Contractor shall provide two copies of a controller chart showing the irrigation system installed. The chart shall be done on a half size photographic reproduction of the irrigation plan and shall reflect the as-built data. Each station shall be shown in a different color and control wire locations shall be indicated. The complete plan shall be laminated on each side with a 20 mil acrylic plastic sheet. A 3/4" brass grommet shall be placed in each top corner. The Contractor shall obtain approval of the controller chart from the Project Manager, before proceeding with the plastic lamination.

3.25 SITE CLEANING

Clean and dispose, legally, all debris from site. Remove all storage rooms and all other constructions and make site ready for planting work to follow. Debris not cleared for landscape work may be backcharged.

3.26 WARRANTY FOR IRRIGATION SYSTEM WORK

The entire sprinkler irrigation system shall be warranted to be free from defects in materials and workmanship, and installed in accordance with this Notice to Contractors and the SSPWC. The Contractor shall be required to repair or replace any defects in material or workmanship which may develop within one (1) calendar year from the date of acceptance, ordinary wear and tear and unusual abuse or neglect excepted. Further, the Contractor shall be required to make any necessary repairs within 24 hours of notification at no cost to the County. If the Contractor or his agent fail to make such repairs within the stipulated time, the Owner shall make such repairs or have repairs made by a third party and bill the Contractor for all expenses that accrue from making such repairs.

3.27 GUARANTEE AGAINST SETTLEMENT

If, within one (1) calendar year from the date of acceptance, settlement occurs along mainlines, lateral lines, at valve boxes, or other irrigation related appurtenances, and adjustments in pipes valves and sprinkler heads are required to bring the system, finish grade, or paving to the level of the permanent grades, the Contractor shall make all adjustments without additional cost to the County, including complete restoration of any planting, paving, or other improvements damaged as a result of settlement.

3.28 BACKFLOW DEVICE INSTALLATION AND CERTIFICATION

The Contractor shall obtain certification of the backflow device and submit two copies of the certification to the County Engineer at the Operational Final. The backflow certification shall be made on the County Health Department standard form and filed with the County Health Department, Cross Connection Section, Room 150, 2525 Corporate Place, Monterey Park, CA, 91754. The contractor shall paint all backflow prevention devices above ground with two coats of forest green enamel. Mask all identification tags prior to painting, (308-5.3). After certification remove all test cocks, replace with threaded brass plugs, and deliver test cocks to the County Engineer.

3.29 RECLAIMED WATER IRRIGATION PIPING AND PROCEDURES

Not applicable to this project.

3.30 DOMESTIC PIPING IN CONJUNCTION WITH RECLAIMED WATER

Not applicable to this project.

3.31 RECLAIMED WATER PIPELINE INSTALLATION – GENERAL

Not applicable to this project.

3.32 OBSERVATIONS

Observations will be performed by representatives of the County (including the Landscape Architect) at the following times and at random visits when the observer may be on the site. When observations have been conducted, show evidence of when and by whom these observations were made.

A. Prework conference. To be conducted prior to any irrigation work under this contract.

B. Sprinkler head staking.

C. Observation of flushing.

D. Observation of pressure tests.

E. Observation of coverage performance.

F. Final observations of the completed installation.

G. Contractor shall not cover any work prior to observation by the County Representative.

H. All observances shall be requested at least 48 hours in advance. All work shall meet the County Engineer's approval, or be rectified at no additional cost to the County. Contractor shall be financially responsible for all members of the team of observers for unprepared observation appointments.

3.34 ITEMS FURNISHED

At time of final acceptance, Contractor shall deliver to the County:

A. One control valve key, 30" long, for every six remote control valves installed.

B. One coupler key with hose bibb attached for every six quick coupler valves installed.

C. One loose key for every six quick coupler valves installed.

D. Two special wrenches suitable for operating each type of shut-off valve installed.

E. Two tools for disassembly and assembly, or adjustment, of each type equipment used in this installation requiring such special tools.

F. Two valve box keys for every 12 lock lid valve boxes used in this installation.

G. Operating instructions and parts lists, as printed by each manufacturer of each type of equipment installed. Refer to "Materials" section of the specifications and legend on drawings.

H. List of equipment with names and addresses of local manufacturer representatives.

I. "As-built" drawings and controller charts.

J. Provide 10 extra sprinkler heads & emitter devices / nozzles per each indicated in the irrigation schedule on the drawings.

3.35 FINAL ACCEPTANCE

Prior to walking irrigation system with the County Representative, the Contractor shall pre-walk irrigation system with their own crew to ensure compliance with plans and specifications.

The Contractor shall operate each system in its entirety for the County's Representative at the time of final observation. Any items deemed not acceptable by the County Representative shall be reworked to the complete satisfaction of the Representative. All equipment shall be checked and adjusted in height, location, performance and appearance at time of final acceptance. All damaged portions shall be replaced with new materials of like-kind.

The Contractor shall show evidence to the County Representative that the County has received all accessories, charts, record drawings, and equipment as required before final site observation can occur.

- END OF SECTION -

SECTION 32 90 99 – PLANTING

PART 1 - GENERAL

1.1 SCOPE

A. Planting work includes, but not limited to, the following:
   1. Preparing existing topsoil/site soil
   2. Soil preparation and fine grading
   3. Maintenance of planting areas for 90 days

1.2 Related work specified elsewhere:
   1. Landscape Grading
   2. Selective Demolition
   3. Landscape Irrigation
   4. Planting Notes on Sheets
   5. Appendix, Protection of Trees

1.3 VERIFICATION OF DIMENSIONS AND QUANTITIES

A. All scaled dimensions are approximate. Before proceeding with any work, the contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Landscape Architect of any discrepancies between the drawings and/or the specifications and the actual conditions. No work shall be done in any area where there is such discrepancy until approval for same has been given by the Landscape Architect or the County Engineer.

1.4 SUBMITTALS

A. Comply with provisions of General Specifications.

B. Submit complete lists of landscape materials and equipment, including manufacturers name and address, specific trade names, catalog numbers complete with illustrations and descriptive literature and clearly mark or underline proposed items; list source of landscape mulch.

C. Submit complete list of plants including nursery source, plant botanical name, quantity, container size and photograph of plant to be supplied. The list shall include all unavailable plants and which nurseries were contacted during contractor's search.

D. Shop Drawings: Required for any landscape structure.

1.5 CERTIFICATIONS

A. Certified Label for all plant material marked with a * on the planting plan list of plants. Each plant supplied to the project, and indicated by the * mark must be tagged for accuracy of identification and verification of the correct variety by having a Verified Tag or label affixed. This label must display the variety with the botanical name of the correct plant printed on the same label. Any plant varieties marked on the planting plan with the above instruction that does not arrive on-site with the required label will be rejected at the contractor's expense, and cannot be installed on the project.

B. In addition to other required certification, furnish a certificate with each delivery of bulk material, including mulch, and mycorrhizal inoculant, stating its source, quantity, type of material furnished and that such item or material conforms to the requirements of this section.

1.6 MULCH

A. Shredded fir bark. Submit mulch sample for approval prior to use.

B. Granite Cobble – size and conditions specified on plan and details.

1.7 OBSERVATION

A. All observation herein specified shall be made by the County Engineer or Landscape Architect. The contractor shall request observation at least 48 hours in advance of the time observation is required. Observation will be required on the following parts of the work:
   1. During preliminary grading, soil preparation, and initial weeding.
   2. When finish grading has been completed, and prior to the planting of ground cover or seeded turf.
   3. When planting and all other indicated or specified work has been completed but prior to maintenance period.
   4. Final observation at completion of maintenance period.

B. The contractor shall be on the project site at the time of each observation.

1.8 AGRONOMICAL SOILS REPORT

A. Contractor to provide and review Agronomical Soils Report and provide amendments to the soil in proposed planting areas per the recommendations of the soils report. See planting notes on sheets.

1.9 MAINTENANCE

A. Contractor shall continuously maintain all areas included in the Contract during progress of the work, the 90-day maintenance period, and until final acceptance of the work.

B. If plantings are not acceptable at the end of the maintenance period for the entire work, due to defective maintenance, the maintenance shall be continued by the Contractor until all work meets the Specifications and can be approved.

C. Maintenance shall include continuous operations of watering, weeding, mowing, rolling, trimming, edging, cultivating, fertilizing, spraying, insect and pest control, seeding, and/or other operations necessary to assure good normal growth.

D. All planted areas shall be kept free of debris and shall be weeded at not more than 10-day intervals.

E. During the installation period and maintenance, the Contractor shall be responsible for maintaining adequate protection for all areas. Any damaged planting shall be repaired at the Contractor's expense.

F. At the termination of the maintenance period, all plant materials shall be live, healthy, undamaged, and free of infestations. All lawn areas shall be completely covered at the time of final acceptance. Inferior plantings shall be replaced and brought to a satisfactory condition before final acceptance of the work will be made.

1.10 GUARANTEE

A. The Contractor shall warrant all trees 15 gallon sized and larger for one year starting with the end of the establishment period. This warranty does not include items damaged due to the County’s neglect and/or to acts of God.

B. The Contractor, within 15 days of written notification by the County Engineer, shall remove and replace all guaranteed plant material that for any reason fails to meet the requirements of the guarantee. Replacement material and plantings shall be to the same specifications as required for the original planting and all replacements shall be guaranteed as specified for the original guaranteed materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. AMMONIUM PHOSPHATE

1. Shall be a standard agricultural grade of ammonium phosphate having guaranteed analysis of 16-20-0.

B. ESTABLISH - GENERAL PURPOSE FERTILIZER

1. Shall have a minimum analysis of 1-1.3-5,(N-P-K), derived from rock phosphate, peat moss, chicken manure, sand, sulfate of potash, gypsum, and EDDHA chelate. As

manufactured by Earth Works Soil Amendment, Inc., (310) 322-9702, or an approved equal.

C. FEATHER MEAL

1. Shall have a minimum analysis of 12-0-0,(N-P-K), derived from feathermeal. As manufactured by Earth Works Inc., (310) 322-9702, or an approved equal.

D. FERTILIZER TABLETS

1. Shall be fertilizer tablets shall be Agriform 21 gram, 20-10-5, available from Western Farm Service, (805) 487-4961 or an approved equal.

E. GYPSUM

1. Shall be agricultural grade.

F. MYCORRHIZAL INOCULUM

1. Tea bags or drench, per manufacturer's specifications per plant size. Tri-C Products 1-800-927-3311 or equal

G. HYDROSEED MULCH FIBER

1. Shall consist of virgin wood fiber of Aspen or Alder. It shall not contain any waste paper, newsprint or straw material. The mulch shall contain a green dye to facilitate application. Fiber shall be as manufactured by Conwed Co., (Green Tag), Silva-Fiber by Weyerhauser Co., or an approved equal, (212-1.2 (e)).

H. HYDROSEED STABILIZER

1. Shall consist of natural muciloid materials supplied by Ecology Controls M-binder, (805) 684-0436, no equal.

I. HYDROBLEND SOIL ACTIVATOR

1. Shall have a minimum analysis of 1.2-1.4-5, (N-P-K), derived from rock phosphate, peat moss, chicken manure, sulfate of potash, gypsum. As manufactured by Earth Works Inc., (310) 322-9702, or an approved equal.

J. MULCH

K. Shall be shredded fir bark mulch, free of all foreign matter including weed and tree seeds. Submit sample of mulch and source to Landscape Architect / County Engineer for approval prior to application. Available from American Soil in Simi Valley (805) 578-0052 or an approved equal.

L. NITROFORM UREAFORM

1. Shall be a standard commercial grade of nitroform having a guaranteed analysis of 38-0-0.

M. ORGANIC AMENDMENT

1. Shall be organic soil amendment, see soils report.

N. OVERSEED TOPDRESSING, EARTH WORKS ORGANIC TOPDRESSING
   1. Shall be derived from composted wood products, peat moss, chicken manure and a wetting agent. As manufactured by Earth Works Inc., (310) 322-9702, or an approved equal.

O. GRANITE COBBLE TOPDRESSING (MULCH)
   1. Shall be locally sourced granite cobble per the sizes indicated on plans and details or an approved equal.

P. POTASSIUM SULFATE
   1. Shall be a standard agricultural grade of potassium sulfate having guaranteed analysis of 0-0-50.

Q. PRE-EMERGENT HERBICIDE
   1. Shall be Balan Granular, by Elanco, or an approved equal. All pre-emergent herbicides, when required, shall be specified and applied by a licensed Pest Control Advisor.

R. ROUNDUP
   1. Shall be a water-soluble herbicide for non-selective control of weeds containing 480 grams per liter of the active ingredient Isopropylamine salt of N-(phosphonomethyl) Glycine (Glyphosate) per U.S. gallon, as manufactured by Monsanto Chemical Company, or approved equal.

S. SOILS
   1. Designated as imported soil for pit planting only as specified herein. The soil test will determine the suitability of soil before installation. Transport soil from the source to its final position unless stockpiling is specified.
   2. Imported Soil:
      a. From a source outside the Project site and in compliance with this section.
      b. Architect may make such inspections and perform such tests as deemed necessary to determine the material meets all requirements.
      c. At least 30 days before scheduled installation, submit the proposed source of soil and a Sample to the Architect. Submit a written request for review, accompanied by a written report of a soils testing laboratory registered by the State of California for agricultural soil evaluation which states that the proposed source complies with these Specifications.
      d. Comply with all recommendations of the soils testing laboratory and provide any soil amendments necessary to achieve proper nutrient levels to support healthy plant growth.
      e. Imported topsoil shall be of a uniform composition and structure, fertile and friable sandy loam garden soil, and be free of roots, clods and stones larger than 1 inch in greatest dimension, pockets of coarse sand, noxious weeds, sticks, brush and other litter and not be infested with nematodes or other undesirable insects

and plant disease organisms. Imported topsoil shall meet the following additional requirements:

1) Gradation Limits: Sand – 50-80%, clay – 20% maximum, and silt – 30% maximum. The sand, clay and silt gradation limits shall be as defined in ASTM D 422.
2) Agricultural Suitability and Fertility: The soil shall be fertile and friable garden soil suitable for sustaining and promoting the growth of the specified plants.

3. Light-Weight Soil for raised storm water planters:
   a. Shall be per Civil specifications.

T. TURFGRASS SEED

1. (Not Used) Seed for seeding and re-seeding turf areas shall be Ballfield Mix 3A by Agronoc-Tec Seed Co., (800) 543-4109, or approved equal.

U. WATER HOLDING POLYMER

1. Shall be "Broadleaf P-4".

V. PLANTS

1. All plants are to be nursery grown under similar climactic conditions as the site. Plants shall conform to the American Standard for Nursery Stock, ANSI Z60.1-2004 as published by the American Nursery & Landscape Association, unless specified otherwise in the plans.
2. Plant Acceptance:
   a. Sample trees, shrubs and groundcovers, as specified in the plans, shall be approved for use and shall be made available to the Landscape Architect for approval, prior to ordering and delivering. Name of the grower, guarantee of availability of quantities and conformance to the specifications must be furnished in writing to the Landscape Architect prior to ordering of the approved plant. Digital color photographs may be used for approval. All plant material must be tagged with botanic name and hybrid variety.
   b. Upon approval of the plant material, ordering may be placed.
   c. Plants shall be transported so that they are not exposed to wind, extremes of temperature, or conditions, which would cause them to dry or sunburn.
   d. **Plants shall be inspected at time of arrival** to insure they are healthy and in good condition. Any plant found not in conformance with the specifications, shall be rejected. A copy of the shipping bill shall be provided to the inspector at the time of delivery, to insure the proper quantities of plants have been delivered (see Certification requirements above).

W. DECORATIVE GRAVELS

1. Shall be a max. of ¾" crushed granite.
2. Contractor to provide sample for approval.

PART 3 - EXECUTION

3.1 METHODS

A. TOPSOIL PREPARATION – GENERAL
   1. The topsoil shall be the existing class "C" on-site topsoil. Remove all stones over 1 inch in greatest dimension, to a depth of 6 inches below finish grade, (308-2.3.1).
   2. Prior to planting, the top two (2) inches of all areas (including slopes) shall be free of weeds, stones, and other deleterious matter one (1) inch in diameter and larger.

B. TOPSOIL PREPARATION
   1. If not otherwise specified, all turf areas shall receive the following soil preparation. Uniformly broadcast the following materials per 1,000 square feet:
      a. 20 pounds of 12-12-12 quick release commercial fertilizer. These quantities are for bid purposes only. Refer to soils report for final quantities.
      b. Gypsum – 15 pounds
      c. Organic amendment –3 cubic yards in planting areas, sufficient amount to provide soil organic matter in the range of 4% to 7% on a dry weight basis.
   2. The soil preparation materials shall be cultivated into the soil to a depth of 6 inches minimum and thoroughly watered, (308-2.3.1).

C. FINISH GRADING (for Turf Areas)
   1. Finish grading of turf areas shall take place after the soil has dried out to a workable condition following the soil preparation operations. The soil shall be remodeled and smoothed to the required grades and contours, then rolled in two directions at right angles with a water ballast roller weighing 200 to 300 pounds. Any resulting irregularities in the grade after the initial rolling shall be re-raked, cut or filled, then re-rolled until the grade is free from irregularities. No heavy objects shall be taken over the areas at any time. The final finish grade shall be uniform, without abrupt changes in grade, within one-tenth of a foot of the grades shown on the plan, and approved by the County Engineer prior to seeding, (308-2.4).

D. WEED ABATEMENT ("GROW AND KILL")
   1. Weed abatement shall apply to all turf, hydroseed, shrub, tree, and all areas to be planted as shown on plans. The abatement operation shall be commenced only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of turf and planting areas have been completed.
   2. NOTE: It is required that herbicides be applied by a licensed PEST CONTROL APPLICATOR.

E. CONTRACTOR RESPONSIBILITY DURING WEED ABATEMENT OPERATION AND APPLICATION PRECAUTIONS

1. The Contractor is responsible or any and all damage done to plant materials outside of the treatment area. Contractor shall replace, in kind and size, any plant material damaged or killed through the application of herbicide.
2. The following precautions shall be observed in handling and applying herbicide:
    a. Before applying, Contractor shall read and understand all instructions provided by the manufacturer.
    b. Product shall not be used when winds are gusty or in excess of 3 miles per hour, or when any other conditions exist which would result in drift.
    c. Avoid combinations of pressure and nozzle type or adjustment that result in mist.
    d. Do not apply during rain, or if rain is forecast within twelve hours. If rain occurs within twelve hour period, material must be reapplied after plant growth has dried out.
    e. Contractor shall observe extreme care not to allow spray to contact desirable plant material. Use cardboard, plywood, or other appropriate material to shield plant materials outside of the treatment area from overspray.
    f. Do not apply to bare ground.
    g. Do not add any other product to herbicide mix, including spreader-stickers or surfactants.

F. WEED ABATEMENT: GROW AND KILL METHOD

1. Contractor shall follow the "grow and kill" steps set forth below:

    Step 1. Clear the site of all dead or living vegetative growth by hand or mechanical means.

    Step 2. Thoroughly water all turf and planting areas daily to keep soil evenly moist for a period of at least two weeks.

    Step 3. At the conclusion of the growth period, treat all plants within the treatment area with Roundup at an application rate of five (5) quarts of Roundup mixed in 50 gallons of clean water per acre applied by spraying. Thoroughly moisten all plant material with herbicide.

    Step 5. Do not water or otherwise disturb treated areas for a period of two (2) weeks.

    Step 6. After two-week kill period, remove all dead plant growth. If any living plants are observed, entire plant, including roots, shall be removed by hand. Minimize physical disturbance of the soil.

G. WEED SUPPRESSION (NON-HERBICIDE WEED REMOVAL)

1. Weed suppression, shall apply to all turf and planting areas. The suppression operation shall be commenced only after removals, grading, hardscape construction, installation of irrigation system, soil preparation, and fine grading of turf and planting areas have been completed. Contractor shall thoroughly water all turf and planting areas for a period of two weeks minimum prior to commencing removal.

Contractor shall clear site of all dead vegetation and living weeds by hand or mechanical means. All removed vegetation shall be properly disposed of off-site.

H. TREE AND SHRUB PLANTING

1. Plant pits for all 1 gallon, 5 gallon, 15 gallon, and all boxed size trees, shall be twice the width and equal to the depth of the container rootball. Note that this requirement differs from the SSPWC (308-4.5).
2. Unless otherwise specified, the backfill mix for all plants shall be 60% percent on site soil and 40% percent Type I organic soil amendment and 1 lb. of "Establish," general purpose fertilizer per gallon of container, or 1 lb. per each 4" of box size. “Broadleaf P-4” water holding poylmer shall also be added to the backfill mix at the rate of 1 oz. per foot of rootball diameter.
3. Each plant pit shall also receive "Agriform" slow-release fertilizer tablets, 21 gram, 20-10-5, as shown in the relevant planting details, and as follows:
   1 gallon – 1 tablet
   5 gallon – 3 tablets
   15 gallon - 5 tablets
   One (1) tablet per 4” of box size
4. Space tablets evenly around the perimeter of the rootball, approximately 3 inches below finish surface. After shrub or tree has been planted, water by hand to hydrate polymer.
5. Remove all watering basins around trees planted in lawn areas at the end of the maintenance period. All trees planted in lawn areas shall have a 36-inch diameter unplanted area around each tree.
6. Contractor shall apply an 8-8-4 commercial slow-release fertilizer to all planting areas at a rate of 20 pounds per 100 square feet upon completion of the ground cover planting and at thirty (30) day intervals there after until the end of the plant establishment period. Thoroughly water all planting areas following the application of the fertilizer. All fertilizer application shall be performed under inspection of the project manager.

I. METHOD “A” TURF PLANTING – REPAIR, SEEDING

1. Irrigation trenches shall be fully compacted and the grade brought flush with the adjacent undisturbed finish grade. Irrigation trench areas and areas where equipment has damaged the existing turf shall be seeded per this section.
2. Sow seed at a rate of three (3) pounds of GN1 Bermuda per 1,000 sq. ft. Mulch all seed with 1/4"(or 3/4 cubic yard per 1,000 sq. ft.) of Bio-organic Finale.

J. METHOD “B” TURF PLANTING, HYDROSEEDING

1. The lawn seed mix for turf planting shall contain the following materials at the rates specified:
   Mulch Fiber – 1,500 lbs./acre (.0345 lbs./sq.ft.)
   Stabilizer – 120 lbs./acre (.0028 lbs./sq.ft.)

Fertilizer – Hydroblend, at 3,000 lbs./acre (.0688 lbs./sq.ft.)
Seed by Weight – 3 lbs. GN1 Bermuda grass, (coated) per 1,000 sq. ft.

2. The Contractor shall supply a delivery receipt to the BCA Inspector certifying conformance with the specified hydroseed mix and indicating that the slurry has not been mixed for longer than two hours. Slurry which has been mixed longer than two hours shall be recharged with 50 percent more of the specified seed mix, at the Contractor's expense, (308-4.8.2(b)). Delivery tickets shall be forwarded to the County Engineer.

K. MULCHING

1. All planting areas except lawn shall receive a minimum three (3) inch deep layer of mulch per the Planting Details and this specification's materials list. Mulch shall be spread evenly throughout planting beds and tree watering basins. Do not bury ground cover. Cobble mulch to be installed per plan and details.

L. MAINTENANCE AND PLANT ESTABLISHMENT

1. The Contractor shall be responsible for maintenance within the area of work throughout the period of construction and the plant establishment period. The maintenance shall include continuous operations of picking up trash and emptying trash cans daily, watering, the removal of all weeds in planting areas and all broad leaf weeds in lawn areas, mowing, rolling, trimming, edging, cultivation, fertilization, spraying, control of pests, insects and rodents, reseeding, plant replacement (irrespective of cause), or any other operations necessary to assure normal plant growth and the collection and removal of all trash daily. Any malfunctions of, or damage to, the irrigation system caused by the Contractor in the prosecution of his work shall be repaired within 24 hours.
2. The plant establishment period shall be for a period of 90 days unless extended as described in this section. The plant establishment period shall be started when all planting and related work has been completed, in accordance with the contract documents. The beginning of the plant establishment period shall be determined by an on-site review by the County Engineer. Trees and shrubs shall be healthy and vigorous at the completion of the maintenance period. Broken or vandalized tree stakes shall be repaired to a condition as initially installed within seven (7) days of damage.
3. All turf areas shall have 95 percent coverage with bare areas not exceeding three square inches. All turf shall be of the grass specified and be free from all broad leaf weeds. The turf shall not be allowed to grow higher than three (3) inches and shall be mowed to a one and one half (1 ½) inch height. The turf shall be mowed at least twice during the plant establishment period.
4. The entire area of work shall be kept free of weeds, trash or other debris during the maintenance period. The Contractor shall maintain the area of work at maximum

seven (7) day intervals and perform any needed mowing of existing lawns within the area of work when the grass reaches a four (4) inch height.

5. Five weeks after lawn seeding the Contractor shall apply a slow release 38-0-0 granular fertilizer at a rate of 15 pounds per 1000 sq. ft. to all lawn areas. The fertilizer shall be applied in the presence of the BCA Inspector.
6. The Contractor shall immediately replace any and all plant materials and/or grass which, for any reason dies or is damaged while under the Contractors care. Replacement shall be made with seed and/or plants as indicated or specified for the original planting.
7. The designated plant establishment period is part of the total contract time. The plant establishment period will be extended at fourteen (14) day intervals if, at the end of the plant establishment period, the planting, irrigation and other improvements do not reflect the intent of the plans and Notice to Contractors. All extensions of the plant establishment period shall be subject to the assessment of liquidated damages, (308-6).

END OF SECTION

SECTION 32 91 19 – LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes final grade for finish landscaping.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Imported top soils shall be Class A soil, obtained from a source designated by the Contractor and approved by the County Engineer or the Landscape Architect.

B. Contractor shall guarantee the quality of the top soil with an approved agricultural suitability evaluation report. Submit the soils report to the County Engineer for approval 30-days prior to any soil placement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Coordination and project conditions.

B. Verify trench backfilling has been inspected.

3.2 SUBSTRATE PREPARATION

A. In scheduled turf areas remove debris, roots, branches, stones, in excess of ½ inch in size.

B. In all other scheduled planting areas remove debris, roots, stones in excess of 1 inch in size.

C. Loosen and scarify surface to depth of 24 inches where planting is scheduled. Loosen and scarify in areas where equipment used for hauling and spreading soil has compacted subsoil to a depth of 24 inches.

3.3 PLACING TOPSOIL/SOIL AMENDMENTS

A. Grade soil/soil amendments in areas where seeding, and planting, are required to thickness as scheduled to a nominal depth as per Landscape Planting Plans. Place soil/soil amendments during dry weather.

B. Fine grade existing topsoil/soil amendments to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Where trees have been removed, fill area and compact to meet final grades.

D. Remove roots, weeds, rocks, and foreign material while spreading.

E. Manually spread topsoil close to plant material.

F. Lightly compact and roll placed topsoil.

G. Remove surplus soil from site.

H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 PROTECTION OF INSTALLED WORK

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving and curbs.

C. Prohibit construction traffic over topsoil.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 33 11 00 – SITE WATER DISTRIBUTION UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 - General Requirements

B. Division 22 – Plumbing

C. Section 31 23 23 – Excavation and Fill for Utilities

D. Section 32 13 13 - Site Concrete Work

1.2 SUMMARY

A. Section includes:
   1. Site water distribution systems located outside the building perimeter, extending to an existing water line or meter.

1.3 SUBMITTALS

A. Shop Drawings: Submit site plan indicating locations of lines, valves, and related appurtenances.

B. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publications have been performed, and the performance requirements have been satisfied.

1.4 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:
   1. American National Standards Institute (ANSI):
      a. ANSI H23.1 - Seamless Copper Water Tube.
   2. NSF International (NSF):
      a. ANSI/NSF 61 Drinking Water System Components – Health Effects.
      b. ANSI/NSF 372 Drinking Water System Components – Lead Content.
   3. American Society of Mechanical Engineers (ASME):
      a. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
      b. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
      c. ASME B16.26 - Cast Copper Alloy Fitting for Flared Copper Tubes.

d. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings.

4. American Society for Testing and Material (ASTM) International:
   a. ASTM A36 – Standard Specification for Carbon Structural Steel.
   b. ASTM A240 – Standard Specification for chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   c. ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
   d. ASTM A536 - Standard Specification for Ductile Iron Castings.
   e. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings.
   f. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   g. ASTM B75 - Standard Specification for Seamless Copper Tube.
   h. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   i. ASTM B152 – Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar.
   j. ASTM 17 – Standard Specifications for Copper Alloy Sand Castings for General Applications.
   k. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   l. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
   m. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
   n. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   o. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
   p. ASTM D3350 - Standard Specification for Polyethylene Plastics and Fittings Materials.
   q. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
   r. ASTM F2206 - Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE).
   s. ASTM F477 - Standard Specification for Elastomeric Seals for Joining Plastic Pipe.
   t. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

5. American Water Works Association (AWWA):
   a. AWWA C104/A21.4 - Cement-Mortar Lining For Ductile-Iron Pipe and Fittings.
   b. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings
   c. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

d. AWWA C115/A21.15 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.
e. AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings for Water Service
f. AWWA C207 – Steel Pipe Flanges for Waterworks Service Sizes 4 In. Through 144 In.
g. AWWA C500 - Metal Seated Gate Valves for Water Supply Service.
h. AWWA C503 - Wet- Barrel Fire Hydrants.
i. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 inches through 24 inches (50-mm through 600-mm) NPS.
j. AWWA C510-89 - Standard for Double Check Valve Backflow-Prevention Assembly.
k. AWWA C511 - Reduced-Pressure Principal Backflow-Prevention Assembly.
l. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
m. AWWA C800 - Underground Service Line valves and Fittings.
n. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 In. Through 12 In., for Water Transmission and Distribution.
o. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. Through 3 In., for Water Service.
p. AWWA M23 - PVC Pipe - Design and Installation.
q. AWWA M55 - PE Pipe - Design and Installation.

6. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
   a. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.
7. Uni-Bell PVC Pipe Association (UBPPA):
   a. UBPPA UNI-PUB-09 - Installation Guide for Gasketed-Joint PVC Pressure Pipe (C900).
8. Underwriters Laboratories Inc. (UL):
   a. UL 246 – Standard for Hydrants for Fire-Protection Service.
   b. UL 262 – Standard for Gate Valves for Fire-Protection Service.
   c. UL 312 – Standard for Check Valves for Fire-Protection Service.
9. National Pollutant Discharge Eliminations System (NPDES):
   a. Comply with storm water requirements of general permit for storm water discharges when flushing pipe systems including storm drains and maintaining logs.
10. Plastic Pipe Institute (PPI):
    a. TN-38 – Bolt Torque for Polyethylene Flanged Joints.
    b. TR-4 – Technical Report requirements of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipes.
    c. TR-33 – Technical Report for Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe.

B. Provide valves from the same manufacturer.

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. No pipe, pipe fitting, or any other fitting or fixture intended to convey or dispose water for human consumption for drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of Health and Safety Code 116875. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

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.

1.5 PRODUCT HANDLING

A. Store items above ground on platforms, skids, or other required supports.

B. Protect materials from direct sunlight.

C. Protect coating and linings on piping, fittings, and accessories from damage. Repair and/or replace damaged coatings or linings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipes, Fittings, and Joints:

P-1: Underground water service pipe sizes up to 3-inch shall be Copper water tubing, Type K hard, ANSI H23.1, ASTM B88, IAPMO IS. Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

An approved protective wrap shall be used to completely isolate and protect underground copper tubing and extend past the surface a minimum 12-inch. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.

PF-1a: Copper Press-Connect pressure fittings, comply with ASME B16.51 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-1b: Wrought Copper - solder type ASME B 16.22.

Manufacturer: Mueller Brass, Nibco, Lee Brass, or equal.

PF-1c: Grooved end type– ASTM B75 or ASTM B152 and ASME B16.22 Wrought Copper, bronze sand casting per ASTM B584 copper alloy CDA 836 per ASME B16.18. 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: Victaulic, or equal.

P-2: Underground water service pipe sizes up to 3-inch shall be high density polyethylene pipe (HDPE) with tracer wire. Pipe and fitting system shall be pressure class 333 (DR7). All material shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350 with a minimum cell classification of 445474C. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. HDPE products shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

Pipe sizes smaller than 3" shall be manufactured to the dimensional requirements listed in ASTM D3035, and 3" Pipes shall have a manufacturing standard of ASTM F714. Pipes and fittings shall meet AWWA C901 and shall be listed as meeting NSF-61.

Installer shall be certified by manufacturer for HDPE pipe and joint installation.

Manufacturer: ISCO, JM Eagle or equal.

PF-2a: Butt Fusion HDPE Fittings shall meet the following requirement:

a. Molded fittings shall comply with the requirements of ASTM D 3261.
b. All fabricated elbows, tees, reducing tees and end caps shall be produced and meet the requirements of ASTM F2206.
c. Socket fittings shall meet ASTM D 2683.
d. Installer shall be certified by manufacturer for this type of joint installation.

Manufacturer: ISCO, JM Eagle or equal.

PF-2b: Bolted Connections- Flanges and MJ Adapters shall be fused onto the pipe and have a minimum pressure rating equal to or greater than the pipe and shall meet the following requirement:

a. Metallic back-up rings (Van-Stone style lap joint flanges), shall have a radius on the inside diameter of the bore so as to be compatible with HDPE Flanges. Back up rings shall have bolt pattern that will mate with AWWA C207 Class D (generically known as 150 pound patterns).

b. Flange assemblies shall be assembled and torqued according to PPI TN-38.
c. Installer shall be certified by manufacturer for this type of joint installation.

P-3: Underground water service pipe sizes 4-inch and larger shall be C900 water service pipe material complying with AWWA C900, and ASTM D1784 Cell Class 12454B with tracer wire, NSF and UL listed. Piping shall be plain end or gasket bell end, pressure class 305 (DR14) with cast iron pipe equivalent outside diameter.

PF-3: Fire Water Service, Domestic Water and Irrigation Service Line Fittings, Joints and Jointing Materials shall be Ductile-iron with mechanical joints conforming to AWWA C110/A21.10 or AWWA C153/A21.53, C900 compatible, and shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings.

a. Pipe joints shall be push on as specified in ASTM D3139.
b. Joints between pipe and metal fittings, valves, and other accessories shall be mechanical joints as specified in AWWA C111/A21.11.
c. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.
d. Gaskets for push on joints for pipe shall conform to ASTM F477.
e. 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.
f. Sleeve-type mechanically coupled joints may be provided instead of push-on joints on plain-end PVC plastic joints. Comply with requirements of ASTM D3139.
g. Comply with installation guide UBPPA UNI-PUB-09.

Manufacturer: JM Eagle, Diamond Plastics, North American Pipe, or equal.

P-4: Aboveground water service pipe shall be Type 316L Stainless Steel, Schedule 40 water 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: Viega, or equal.

PF-4: Type 316L Stainless Steel, Schedule 40 Press Fittings. For water service piping systems, provide with EPDM seals. Manufacturer's representative shall instruct installers and certify them for joint installation.

Manufacturer: Viega, or equal.

B. Gates Valves for PVC:

1. Non-rising stem type with resilient wedge gates or iron body bronze wedge gates and mechanical joint ends conform to AWWA C500.
2. Non-rising stem type with mechanical joints ends shall conform to AWWA C509.
3. Valves designed for a working pressure of 175 PSI shall be inside-screw type with operating nut, and resilient wedge type gate. Valve shall be provided with mechanical joints as required for the pipe to which it is intended to connect.
4. Valves with UL listing of 262 shall conform to AWWA C500. Valves shall open by counter-clockwise rotation of valve stem.
5. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.
6. Sleeve type mechanical couplings may be provided instead of mechanical and push on joint ends.
7. Valve ends and gaskets for connection to sleeve type mechanical couplings shall conform to specified requirements for the joint or coupling.

C. Gate Valves in Valve Pits:
1. Outside screw and yoke rising stem type valves with resilient wedge gates and flanged ends shall conform to AWWA C500.
2. Outside screw and yoke rising stem type valves with flanged ends shall conform to AWWA C509.
3. Outside screw and yoke type Valves with double disc gates or split-wedge type gate and flanged ended ends shall be designed for 175 psi and conform to UL 262.
4. Provide valves with hand wheels that open by counterclockwise rotation of the valve stem.
5. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.

D. Check Valves for PVC:
1. Valves shall be swing-check type conforming to AWWA C508 or UL 312.
2. Valves shall be provided with cast iron or steel body and cover, flanged ends and clear port opening.
3. Valves shall be designed for a working pressure of 175 PSI.

E. Fire Hydrants:
1. Before procurement, verify approval issued by the County of Los Angeles or Fire Department having jurisdiction.
2. Hydrants shall be wet barrel types conforming to AWWA C503 or UL 246.
3. Only 1¾-inch pentagonal nuts are to be provided on stems and protective caps.
4. Specified hydrants:
   a. Clow/Rich # 850 or 860
   b. James Jones #J3700 Fluted Spool
   c. Equal.

F. Valve Boxes: 14 ¾-inch by 20-inch by 12-inch cast concrete with cast iron, traffic grade cover marked “WATER” (for use over water valves).
1. Brooks 36-H MB with No. 36-T cast iron cover EISEL 363.5, or equal.

G. Mechanical Thrust Restraint:

1. Restraint shall be incorporated into the follower gland.
2. Restraint shall consist of individually actuated wedges that increase resistance to pull out as internal pressure or external forces increase.
3. Gland shall be ductile iron conforming to ASTM A536.
4. Provide twist off nuts and tee-head bolts of the same size to ensure proper actuating of restraint devices.
5. Restraining device shall be provided with pressure rating equal to that of the pipe on which it is installed.
6. Restraining gland shall be UL listed.
7. Mechanical thrust restraint devices shall be EBAA Iron "Megalug" or equal.

H. Restraint Device Adapters:
1. Restrained flange adapters shall be provided instead of threaded or welded flange spool pieces on plain end of ductile iron or PVC pipe.
2. Flange adapters shall be manufactured of ductile iron conforming to ASTM A536 and be provided with flange bolt circles compatible with AWWA C115/A21.15.
3. Restraint of flange adapter shall consist of a multiple number of individually actuated gripping wedges to maximize restraint capability.
4. Torque limiting actuating screws shall be provided to insure proper initial set of gripping wedges.
5. Flange adapter shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow at least 0.6 inch of gap between end of pipe and mating flange without affecting integrity of seal.
6. Flange adapter shall be provided with a safety factor of at least 2:1 for rated pressure.
7. Restraint device adapters shall be EBAA Iron "Megaflange", or equal.

I. Tracer Wire for Nonmetallic Pipes: Tracer wires shall be continuous solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistance insulation. Blue plastic covered for domestic water and red for fire sprinkler. (Aluminum wire is prohibited). Provide in sufficient length to be continuous over each installed section of nonmetallic pipe.

J. Pipe markers shall be a concrete plaque inscribed with the word "WATER."

K. Water Service Line Materials:
1. Water Service Line Piping Material: Refer to article 2.01.A within this section.
2. Water Service Line Appurtenances
    a. Corporation stops shall be ground key type; manufactured of bronze conforming to ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint or flared tube compression type joint connection. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to flared copper tubing and shall conform to ASME B16.26.
    b. Goosenecks shall be type K copper tubing. Joint ends for goosenecks shall be as required for connecting to corporation stop and service line. Where multiple gooseneck connections are required for individual service, connect goosenecks to service line through brass or bronze branch connection; the

total clear area of branches shall be at least equal to clear area of service line. Length of goosenecks shall be as indicated or required.

c. Curb or service stops shall be ground key, round way, inverted key type; bronze, conforming to ASTM B61 or ASTM B62; and rated at 150 psi. Ends shall be as required for connection to service piping. Arrow shall be cast into body of curb or service stop indicating direction of flow.

d. Gate valves 2.5-inch and larger shall be MSS SP-80, Class 150, solid wedge, or resilient wedge gate, and non-rising stem. Valves shall be provided with flanged end connections. Provide hand wheel operators if easily accessible. Provide operating nut if inside a vault, pit or valve box.

e. Gate valves in valve pits 2-inch, and smaller shall be MSS SP-80, Class 150, bronze, solid wedge, inside screw, rising stem. Valves shall be provided with flanged end connections or threaded end connections with union on one side of valve and hand wheel operator.

f. Valve boxes shall be provided at each gate valve installed underground. Valve boxes shall be a size suitable for valve on which it is installed.

L. Water meter will be installed by water purveyor for the area, unless noted otherwise.

M. 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) blow out piping, same size as blow out plug:
2-inch and smaller:	C.M. Bailey #100-A, bronze, 250 pound, or ductile iron with fusion bonded epoxy coating.
2 ½-inch and larger:	Watts 77F-DI-FDA-125 pound, or other ductile iron fusion bonded epoxy coated flanged strainer, conforming to ASTM A312 for the strainer body, and ASTM A240 for the stainless steel strainer element. (No iron body strainer shall be used on potable water that is not fusion bonded epoxy coated inside and out.)

C.M.Bailey, Armstrong, Wilkins, Watts, or equal.

STR-2	"Y" pattern, cast iron bodies, 125 psi, Monel screen 16 square. mesh. 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-inch, flanged ends for 2 ½-inch and larger perforations, in accordance with the following:

Bailey #100, Armstrong, Rp & C, Keckley, or equal.

STR-3 Bucket type, flange, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations (mounted above grade for water service). All sizes, for lines serving fire sprinkler risers:

Bailey #1, Zurn 150 Series, Rp 7 C, Watts 97fb-Fsfe, or equal.

STR-42" and larger: Watts 077-F-SS Stainless steel flange type strainer, or equal conforming to ASTM A312 for strainer body, ASTM A240 for the SS strainer element and ASTM A36 for base flange material.

N. Backflow Preventer Assemblies:
   1. Assembly shall be provided with flanged connections, ductile iron with fusion bonded epoxy coated construction, bronze, or stainless steel.
   2. Backflow preventer shall be suitable for cold water working pressure of 175 psi.
   3. Internal parts shall be designed for replacement without removing valves from line.
   4. Double check backflow preventer assembly shall consist of two independently acting spring cam or poppet style check valves, 2 shut-off valves and 4 test cocks. Check valve shall be designed to provide drip tight closure against reverse flow, low pressure drop at maximum flow capacity. Spring-loaded checks shall cause valve to seal against a higher inlet pressure than outlet pressure when there is no flow.
   5. Double check backflow preventer assembly shall meet AWWA Standard C510-89. Assembly shall be Ames 2000ss, Febco 850, Watts 709, Wilkins 350, or equal.
   6. Reduced pressure backflow preventer assembly shall consist of two check valves located between two shut-off valves with an area of reduced pressure between two check valves and a relief device arranged to discharge to atmosphere.
      a. Comply with AWWA Standard C511.
      b. Fluctuation in piping pressure shall not cause cycling. Backflow preventer shall automatically maintain low pressure zone to positively prevent backflow of water into system. Assembly shall automatically indicated failure of any part vital to backflow prevention by the continuous discharge relief device.
      c. Reduced pressure backflow preventer assembly shall be Cla-Val Model RP-4, or equal.
   7. Backflow prevention assemblies (devices), shall be tested and certified by a certified backflow tester, and a test report shall be provided to the water agency having jurisdiction. Testing shall be performed in the presence of the Project Inspector.

PART 3 - EXECUTION

3.1 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 23 23 - Excavation and Fill for Utilities.

3.2 PIPE INSTALLATION

A. Project site water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.

3.3 CLEARANCES OF WATER LINE

A. Building or Structures: Two feet.

B. Parallel to Sewer Line:
   1. Water line 4-inch or less in diameter shall not be installed in a common trench with the building sanitary drain unless the bottom of the water line is at least 12 inches above the top of the building sanitary drain or where the water line is installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the building sanitary drain.
   2. Water lines 6-inch and larger in diameter shall be separated from the Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, in accordance with the requirement of the State of California, Human and Welfare Agency, Department of Health Services.

C. Crossing Sewer Line:
   1. A water line shall be separated from sanitary sewer in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).
   2. Install water line a minimum of 12 inches clear, above or below a sanitary sewer.
   3. A water line 6-inch or greater in diameter, crossing under a Project site sanitary sewer line, shall be installed with joints located at least 10 feet away from each side of the sanitary sewer line.
   4. A water line 6-inch or greater in diameter, crossing over a Project site sanitary sewer line, shall be installed with joints located at least 4 feet away from each side of a purple pipe or sanitary sewer line.

D. Install water lines no closer than 10 feet horizontally clear from the edge of sewage leach fields, seepage pits, and septic tanks.

3.4 PIPE INSTALLATION AND JOINING

A. Install all piping and fitting systems according to the manufacturer requirement.

B. Remove fins and burrs from pipe and fittings.

C. Clean piping, fitting, valves, and accessories before installing. Maintain items in a clean condition.

D. Provide proper facilities for lowering sections of pipe into trenches. Do not drop into piping, fittings, or other materials into trenches. Accurately cut pipe and install without

springing or forcing. Replace any piping or fitting that does not provide sufficient space for proper installation of joining material.

E. Blocking or wedging between bells and spigots is not permitted. Install bell and spigot pipe with bell end pointing in the direction of flow.

F. Install piping to the lines and grades indicated or required. Low points and dips are not permitted. Support piping at proper elevation and grade with secure and uniform supports. Wood support blocking is not permitted. Where sand cement slurry will not be furnished for backfill, install piping so that full length of each section of pipe and each fitting will solidly rest on pipe bedding. Excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated or required for installation. Provide proper allowances and devices for expansion and contraction of piping and systems.

G. Maintain trenches free of standing water until pipe joints have been installed.

H. At the end of each day close open ends of pipe with temporary caps of the same material as the pipe.

I. Do not install piping when trench or weather conditions prevent proper installation.

J. Drywells shall be installed per manufacturer.

3.5 INSTALLATION OF TRACER WIRE AND PIPE MARKERS

A. Tracer Wire: Install continuous length of tracer wire for full length of each run of nonmetallic pipe. Fasten wire to top of pipe in such a manner that it will not be displaced during construction operations. Wire shall be fastened to pipe at not greater than 20-foot intervals. Wire shall terminate above finished grade with a 12-inch lead taped around each riser. Provide a tracer wire to grade under a permanent marker where straight-line transitions of metallic to non-metallic pipe are installed.

B. Underground Pipe Markers: Provide markers at grade where non-metallic pipe is installed and for each horizontal change in direction.

3.6 CONNECTIONS TO EXISTING WATER LINES

A. After Project Inspector has inspected installation, perform connections to servicing water lines. Schedule service shutdown for connecting new system at a time causing minimum disruption.

3.7 INSTALLATION OF HDPE WATER SERVICE LINE

A. All HDPE pipe and fittings shall be cut, joined, and installed in accordance with the manufacturer's recommendations. Joining, and laying of polyethylene pipe shall be

accomplished by personnel experienced and certified in working with polyethylene pipe systems.

B. Jointing:
   1. All HDPE pipe shall be joined to itself by the heat fusion process which produces homogeneous, seal, leak tight joints. Tie-ins between sections of HDPE pipe shall be made by butt fusion whenever possible.
   2. The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. A record or certificate of training for the fusion operator must be provided that documents training to the fundamentals of ASTM F 2620.
   3. The employer of the fusion machine operator is responsible for the fusion joint quality of the fusion weld made by that individual. The employer is responsible for documenting all training and qualification records for that individual, including compliance to any code requirements for fusion/bonder operators.
   4. All HDPE fusion equipment operators shall be qualified to the procedure used to perform pipe joining. Fusion equipment operators shall have current, formal training on all fusion equipment employed on the project approved by manufacturer. Training received more than two years prior to operation with no evidence of activity within the past 6 months shall not be considered current.

C. Installation:
   1. Buried HDPE pipe and fittings shall be installed in accordance with AWWA Manual of Water Supply Practices M55 Chapter 8. The Design Window identified in AWWA M55 Chapter 5 shall be considered acceptable design and installation conditions.
   2. Unless required by design documents, no thrust blocks shall be placed in the HDPE pipe system since the fused system is fully restrained.
   3. All appurtenances (tees, elbows, services, valves, etc.), must be independently supported and shall not rely on the pipeline and its connections for this support. Excessive stresses may be encountered when appurtenances are inadequately supported.

3.8 INSTALLATION OF C900 PLASTIC WATER SERVICE LINE

A. Unless otherwise indicated, install pipe and fittings as specified and in accordance with UBPPA UNI-B-09 and AWWA M23, Chapter 7, “Installation”.

B. Jointing:
   1. Provide push on joints with elastomeric gaskets specified for this type of joint, furnishing either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push on joint connections, provide pipe with push on joint ends furnished with factory installed bevel; for push on joint connections to metal fittings, valves and other accessories, square cut spigot end off pipe end.
   2. Provide push on joint lubricant recommended by manufacturer.
   3. Install push on joints for pipe-to-pipe connections in accordance with UBPPA UNI-PUB-09 and AWWA M23, Chapter 7, "Installation."

4. Install push on joints for connection to fittings, valves, and other accessories in accordance with requirements of UBPPA UNI-PUB-09 and with applicable requirements of AWWA C600.
5. Compression-type joints/mechanical-joints with gaskets, glands, bolts, nuts and internal stiffeners shall be installed in accordance with the requirements of UBPPA UNI-PUB-09 and AWWA C600 and Appendix A to AWWA C 111/A21.11.
6. Square cut spigot off end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.
7. Sleeve-type mechanical couplings shall be provided in strict accordance with coupling manufacturer's recommendations using internal stiffeners as specified for compression-type joints.

C. Provide mechanical thrust restraint devices for anchorage and piping unless thrust blocks are indicated on the Drawings. Thrust blocks shall be installed in accordance with the requirements of UBPPA UNI-PUB-09 except that size and location of blocks shall be as indicated. Thrust blocks shall be provided as specified in Section 32 1313 - Site Concrete Work.

3.9 INSTALLATION OF VALVES

A. Provide gate valves conforming to AWWA C500 and UL 262 in accordance with AWWA C600 for valve and fitting installation and with recommendations of AWWA C500 Appendix "Installation, Operation, and Maintenance of Gate Valves".

B. Provide gate valves conforming to AWWA C600 in accordance with AWWA C509 for valve and fitting installation and with recommendations of AWWA C500 Appendix "Installation, Operation, and Maintenance of Gate Valves".

C. Provide gate valves on PVC water service lines in accordance with AWWA M23 Chapter 7, "Installation."

D. Provide check valves and fittings in accordance with applicable requirements of AWWA C600 unless noted otherwise on the Drawings.

E. Provide gate and check valve joints as specified for the type of joints between pipe and fittings.

3.10 INSTALLATION OF HYDRANTS

A. Install hydrants according to requirements of AWWA C600 for hydrant installation and as indicated. Provide joints as specified for the type of joints between pipe and fittings.

B. Install hydrant with a 6-inch key gate valve between 4 and 10 feet from the hydrant.

3.11 INSTALLATION OF STRAINERS

A. Strainers shall be installed on each water line downstream of the meter, above grade at the pressure regulating station. When a pressure regulating station (assembly) is not provided, “wye” type flange strainer shall be provided, with a shut off valve on the inlet and the outlet side.

B. If the water line is serving fire sprinkler risers or hydrants, then an approved fire service strainer shall be used: Watts 97DB-FSFE, or equal.

3.12 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. For complete requirement and procedure refer to section 22 1000, article 3.12.

3.13 ELECTROLYSIS PREVENTION

A. A minimum 6-inch long brass nipple shall be installed at locations specified or as required. Flanges shall be provided with a complete insulating component consisting of; gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at locations indicated or as required. Dielectric fittings are prohibited.

B. Where steel or cast iron below grade connects to copper or brass piping above grade, the transition from steel or cast iron pipe to copper or brass pipe shall be installed in an above grade accessible location.

C. Underground connections between dissimilar metals shall be in accessible yard boxes.

D. Above ground dielectric connections shall be exposed.

3.14 ABANDONING WATER LINES AND STRUCTURES

A. Water lines and appurtenances to be abandoned in place shall be cut and removed from areas where new Work is being installed.

B. Cap or plug abandoned existing drain lines below grade in a yard box and according to CBC.

3.15 TESTS AND INSPECTIONS

A. Provide labor, equipment, materials, test equipment and incidentals required for performing required field tests.

B. Tests shall not be performed for five days after concrete thrust blocks have been installed.

C. Testing Procedure: Water service lines shall be tested in accordance with applicable specified standard.

1. Test water service lines in accordance with applicable requirements of AWWA C600. No leakage is permitted.
2. Pressure testing: Before pressure test, fill portion of piping being tested with water for a minimum of 24 hours. Provide hydrostatic pressure of at least 50 psi greater than the maximum working pressure of tested system, but no less than 200 psi hydrostatic test pressure for system piping of 2-inch in diameter and larger. Provide and maintain hydrostatic test pressure for at least two hours to ensure no leakage of any portion of piping or appurtenances under pressure test.

3.16 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.17 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 33 30 00 – SITE SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 - General Requirements

B. Division 22 – Plumbing

C. Section 31 23 23 – Excavation and Fill for Utilities

D. Section 32 13 13 - Site Concrete Work

1.2 SUMMARY

A. Section includes:
   1. Site sanitary sewer systems from the building, to the existing site sanitary sewer.
   2. Closed-circuit television inspection of sewer laterals.

1.3 SUBMITTALS

A. Shop Drawings: Submit site plan indicating locations of lines, valves, and related appurtenances.

B. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publications have been performed, and the performance requirements have been satisfied.

1.4 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:
   1. Standard Specifications for Public Works construction, current edition.
   2. California Plumbing Code, CPC, current edition

1.5 PRODUCT HANDLING

A. Store items above ground on platforms, skids, or other required supports.

B. Protect materials from direct sunlight.

C. Protect coating and linings on piping, fittings, and accessories from damage. Repair and/or replace damaged coatings or linings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipes: Building or Project Site Sanitary Sewer and Vent: Minimum 5 feet away from building boundaries. For piping within 5 feet from building boundaries, and interior piping refer to Division 22 plumbing sections.
   1. PVC (Poly Vinyl Chloride)
      a. For pipe sizes 15 inches and smaller:
      1) SDR 35 conforming to ASTM D3034
      2) Fittings: ASTM D 3034, PVC with bell ends.
      3) Gaskets: ASTM F 477, elastomeric seals
      b. For pipe sizes 18 inches and larger:
      1) SDR 35 conforming to ASTM F679
      2) Fittings: ASTM F679, PVC with bell ends
      3) Gaskets: ASTM F 477, elastomeric seals

B. 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.
   1. Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.
   2. Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

C. Acrylonitrile-Butadiene-Styrene (ABS) DWV Schedule 40 plastic drainpipe and fittings meeting the requirements of ASTM D2661 and D3311. Provide ABS solvent cement for piping and joint connections and install in accordance with IAMPO Standards IS 5, 9, and UPC Section 718.

D. Cleanout Assemblies: Cleanout plug shall be line size.
   1. Outside covered concrete-paved floors: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferrule, UPC recognized brass type plug, scoriated tractor type cover:
      a. JR SMITH 4233
      b. JOSAM 56050-2
      c. ZURN Z-1402-HD
      d. WADE W-7030-Y
      e. equal
   2. In yard boxes: Raised threaded head brass plug.
      a. WADE 8590A
      b. SMITH
      c. ZURN

d. JOSAM,
e. equal.

E. Yard Boxes: Brooks No. 3-TL, NDS, EJIW, or equal, with cast-iron locking cover with the word "SEWER," embossed on the cover in one inch high upper case lettering.

F. Concrete, Mortar and Related Materials: Conform to Section 32 13 13 - Site Concrete Work, unless noted otherwise.

G. Metal Covers, Frames and Accessories:

H. Conform to Section 206 – Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.

I. Metal Covers and Frames: Vandal-resistant design and construction.

J. Hot-dip galvanize steel parts after fabrication and prior to assembly in accordance with Section 210 – Paint and Protective Coating of the Standard Specifications for Public Works Construction.

K. Bedding Materials: Conform to the requirements of Section 31 23 13 - Excavation and Fill or Section 31 23 23 - Excavation and Fill for Utilities, as required.

PART 1 - EXECUTION

1.1 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 23 23 - Excavation and Fill for Utilities.

1.2 PIPE INSTALLATION

A. Project sewer water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.

B. Install sanitary sewers in a uniform alignment and slope to the point of connection as indicated. Before trench excavation, verify size, material, depth, and location of the point of connection.

C. Pipe slope shall not be less than ¼ inch per foot or 2 percent unless pipe inverts are indicated. Where invert elevations are indicated, install pipe at a uniform slope between inverts.

D. Join pipes and fittings as recommended by the manufacturer.

E. PVC pipe and fittings shall be solvent welded. PVC pipe ends shall be cut ninety (90) degrees and Beveled from 10°-15° with a proper beveling tool, cleaned and cleared of

cutting burrs prior to cementing. Use approved reaming tool. Pipe ends shall be wiped clean and free of dirt, moisture, oil, and other foreign material with a rag. Primer shall be applied until the surface of the pipe and fitting is softened. Cement shall be applied with a light coat on the inside of the fitting and two heavier coats on the outside of the pipe. Pipe shall be inserted into the fitting and given a quarter turn while inserting if possible to help seat the cement while both the inside socket surface and outside surface of pipe are wet with solvent cement. Hold joint in place and undisturbed for 1 minute after assembly. Excess cement shall be wiped from the outside of the pipe.

1.3 CLEARANCES OF SANITARY SEWER LINES

A. Building or Structures: Two feet.

B. Parallel to water Line:
   1. Sanitary drain, is not permitted to be installed in a common trench with a potable water line unless the bottom of the water line is at least 12 inches above the top of the sanitary sewer.
   2. In addition, the potable water line shall be installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the sanitary sewer or building sanitary drain.
   3. Project site sanitary sewer, receiving more than one sanitary drain shall be separated from a potable water line in accordance with the requirements of the California, Health and Human Services Agency, and Department of Public Health.

C. Crossing Water Line:
   1. Sanitary drain shall be installed a minimum of 12 inches below the potable water line.
   2. Project site sanitary sewer shall be separated from the potable water main in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).

D. Cleanouts
   1. Provide cleanouts at the upper terminal for each sanitary pipeline, at intervals not exceeding 100 feet in straight run and any fraction thereof and for each aggregate horizontal change in direction exceeding 135 degrees.
   2. Install required cleanouts before back filling of horizontal pipelines.
   3. In unpaved and asphalt paved areas, install cleanouts in yard boxes 2 inches below the yard box cover.
   4. In concrete paved areas, extend cleanouts flush with finish grade.
   5. In traffic areas, install countersunk cleanouts plugs where raised heads protrude

1.4 TESTING

A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Where excessive ground water is encountered test the pipeline for infiltration.

C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

1.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

1.6 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site

END OF SECTION

SECTION 33 40 00 – STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 - General Requirements

B. Section 31 23 23 - Excavation and Fill for Utilities

C. Section 32 13 13 - Site Concrete Work

1.2 SUMMARY

A. Section includes:
   1. Catch basins, grates and frames, curb inlets, drainage pipes and sub-surface drains, manhole covers and frames, surface run-off collection and treatment.
   2. Stormwater treatment systems:
      a. Filterra Bioscape Vault

B. Definitions:
   1. BMP: Stormwater Best Management Practice.
   2. Post Construction BMP: Devices installed by the Contractor for storm water management to be left on site after construction completion.
   3. SWPPP: Storm Water Pollution Prevention Plan.

1.3 SUBMITTALS

A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

B. Product Data: Manufacturer's catalog data for all required materials. Include technical data for accessories, information concerning gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

D. Closeout Documents: At Substantial Completion submit to the County Project Manager two CD's and one hard copy of the documents indicated in paragraphs 1 through 5 below:
   1. Maintenance Log: Provide Microsoft Excel Spreadsheet including the following information:
      a. Maintenance log and upkeep records of the installed Post Construction BMPs. Include the following headers as a minimum: "Date of Service", "Location of BMP", "Type of Maintenance or Service", "Notes", "Next Scheduled Preventive Maintenance Due", and "Inspector Signature".

b. Maintenance Requirements: Include the following headers as a minimum: “BMP Description”, “Location of BMP and Map Grid Location” and “Type of Maintenance or Service Needed”, i.e.; weekly, monthly, quarterly, etcetera. “Stock No.”, “Manufacturer Contact Information”, along with “Frequency” namely: weekly, monthly, quarterly, etcetera and “Special Instructions”.

2. Maintenance Manuals: Provide Maintenance Manual for storm drainage BMP components installed along with requirements, replacement or maintenance schedule and plans with the location of each BMP component. This manual shall include product information cut sheet, shop drawings, vendor information for each component and warranty.
3. Record drawings: ‘As-Builts’ site plan(s) showing Post Construction BMP. Provide a copy of marked record set with red pencil identifying any variations from design documents.
4. Training Documentation:
   a. OWNER attendees sign off training sheet.
   b. Two DVD’s of materials covered in the training and components installed.
5. Post-Construction BMP Maintenance Plan: Submit complete Plan per Attachment “A”, edit per As-Built conditions and provide missing information.

1.4 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic products, pipes, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle all products according to manufacturer's written rigging instructions.

1.6 TRAINING OF OWNER PERSONNEL

A. At Substantial Completion and when the storm drainage system is fully operational, knowledgeable representatives from the contractor and manufacturer(s) of the components specified and installed at the site shall provide up to 8 hours of training. Date, time and location for the training shall be coordinated through the project manager. Have owner attendees sign off training sheet and provide a copy to the project manager.

B. Training period shall cover but not be limited to the following:
   1. Explain the operation of storm drainage system and its design intent.
   2. Explain the maintenance requirements of every component of the system.
   3. Provide recommendations of practices to minimize or eliminate negative impact on the system.

4. Provide maintenance schedule as recommended by the manufacturers for every component and review it with Owner's Maintenance and Operations staff.
5. Conduct a site walk, identify every component of the system and demonstrate its operation.
6. Training shall be conducted with the use of Maintenance log and Maintenance manual.

1.7 SURPLUS MATERIALS

A. Provide sufficient additional materials for each component of BMP that requires replacement or service during the first year.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Storm Drain Pipe:
   1. General: Minimum 5 feet away from building boundaries. For piping within 5 feet from building boundaries, and interior piping refer to Division 22 plumbing sections. Provide piping system in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction. All Soil-tight pipes shall be provided with joints that are function of opening size, channel length, and backfill particle size. A backfill material containing a high percentage of fine-graded soils requires investigation for the specific type of joint to be used to guard against soil infiltration, including the requirement for fabric-wrapped joints.

   2. HDPE (High density Polyethylene): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint and materials of the Standard Specifications for Public Works.

      a. For pipe sizes 10 inches and smaller:
         1. Pipe and Fittings: Corrugated Type S with smooth waterway for coupling joints conforming to AASHTO M252.
         2. Gaskets: ASTM F 477, elastomeric seals

      b. For pipe sizes 12 inches and smaller:
         1. Pipe and Fittings: Corrugated Type S with smooth waterway for coupling joints conforming to AASHTO M294.
         2. Gaskets: ASTM F 477, elastomeric seals
   3. PVC (Poly Vinyl Chloride)
      a. For pipe sizes 15 inches and smaller:
         1. SDR 35 conforming to ASTM D3034
         2. Fittings: ASTM D 3034, PVC with bell ends.
         3. Gaskets: ASTM F 477, elastomeric seals
      b. For pipe sizes 18 inches and larger:

1. SDR 35 conforming to ASTM F679
2. Fittings: ASTM F679, PVC with bell ends
3. Gaskets: ASTM F 477, elastomeric seals

c. 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.
   1. Primer: Weld-On P-70 by IPS, Conforming to ASTM F656.
   2. Cement: Weld-On 711 (gray) by IPS, Conforming to ASTM D2564.

4. Acrylonitrile-Butadiene-Styrene (ABS) DWV Schedule 40 plastic drainpipe and fittings meeting the requirements of ASTM D2661 and D3311. Provide ABS solvent cement for piping and joint connections and install in accordance with IAMPO Standards IS 5, 9, and UPC Section 718.

B. Concrete, Mortar and Related Materials: Conform to Section 32 13 13 - Site Concrete Work.

C. Metal Covers, Grates, Frames and Accessories:
1. Conform to Section 206 - Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.
2. Hot-dip galvanize steel parts after fabrication and before installation, in accordance with Section 210 - Paint and Protective Coatings of the Standard Specifications for Public Works Construction.
3. Grates and Frames:
   a. Vandal-proof design and construction
   b. ADA compliant, in conformance to CBC 11B-302.3.
   c. Rated for vehicular traffic on areas intended for use by motor vehicles.
   d. Hot-dip galvanized.

D. Bedding Material for Pipe: Conform to the requirements of Section 31 23 23 - Excavation and Fill for Utilities, as required.

E. Manhole Brick Mortar, Grout, and Plaster: Conform to Standard Specifications for Public Works Construction, Section 202 - Masonry Materials.

F. Underground concrete structures: Shall be precast and rated for H-20 traffic loading and applicable soil loads. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.

2.2 STORMWATER TREATMENT SYSTEMS

A. Filterra Bioscape
1. Manufacturer: Contech

2.3 NAMEPLATES:

A. Stainless steel or aluminium nameplate permanently fastened to BMP showing the following information:
   1. BMP ID number and BMP type.
   2. Next service day, followed by a one inch by four inch long blank space.
   3. Manufacturer name, model number, telephone number and stock ID number.
   4. Installation or production date.
   5. One inch by four inch blank space for Owner's use.

PART 3 - EXECUTION

3.1 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to the requirements of Section 31 23 23 - Excavation and Fill for Utilities, as required.

3.2 INSTALLATION OF PIPE

A. Conform to Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Non-ferrous drainpipe installed with less than 12 inches of cover to finish grade shall be provided with a 4 inch thick concrete pipe encasement.

3.3 DRAINAGE APPURTENANCES

A. Catch basins, junction chambers, manholes, box culverts, outlet chambers and other drainage structures: Construct as indicated on Drawings and as specified in Section 32 13 13 - Site Concrete Work, and in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

B. Ensure that Post Construction BMP have a visible identifying manufacturer tag with product identification, manufacturer contact information, date of last service and date of next service due.

C. Provide storm drain stencil per County requirements as applicable.

3.4 STORMWATER TREATMENT SYSTEMS/BMPs

A. Filterra Bioscape vaults shall be installed per manufacturer.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.6 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

B. Maintain Post Construction BMP after installation and keep a maintenance log to be turned over to County of Los Angeles at Substantial Completion

END OF SECTION

APPENDIX A

GEOTECHNICAL INVESTIGATION REPORT

GEOTECHNICAL PROFESSIONALS INC.

October 17, 2022

County Los Angeles
Department of Public Works
Project Management Division I
900 S. Fremont Avenue, 5th Floor
Alhambra, CA 91803

Attention: Mr. Salim Sioufi, P.E., C.C.M.
Senior Project Manager

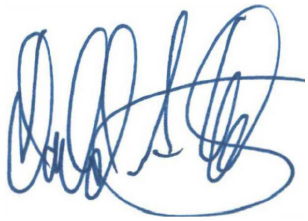
Subject: Report of Geotechnical Investigation
Proposed Outdoor Boat Wash and Building Renovations
Mother's Beach Non-Motorized Boat Facility Project
14010 Palawan Way
Marina del Rey, California
GPI Project No. 3080.23I
Los Angeles County/GPI Contract PW 15556
Project ID 00001833, Project P96242HR

Dear Mr. Sioufi:

Transmitted herewith is a pdf copy of our report of geotechnical investigation for the subject project. The report presents our evaluation of the foundation conditions at the site and recommendations for design and construction.

We appreciate the opportunity of offering our services on this project and look forward to seeing the project through its successful completion. Feel free to call us if you have any questions regarding our report or need further assistance.

Very truly yours,
Geotechnical Professionals Inc.



Donald A. Cords, G.E.
Principal

5736 Corporate Avenue • Cypress, CA 90630 • (714) 220-2211 , FAX (714) 220-2122

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation performed by Geotechnical Professionals Inc. (GPI) for the new outdoor boat wash area and building renovations of the County facility at Mothers Beach in Marina Del Rey, California. The site location is shown on the Site Location Map, Figure 1.

1.2 PROJECT DESCRIPTION

The proposed project will consist of a new outdoor boat wash area on the south side of the building and renovations of the County building leased to a boating club. The existing single-story building covers a footprint of approximately 1,100 square feet (sf) with the boat wash area currently within the west side of the building adjacent to Mother's Beach. The renovation of the building will include the boat wash area being moved outside of the building and a new filter system being installed to treat the rinsed water. The building renovation will increase the surface deck area of the building footprint and increase the building awning (or lower deck flooring) as well a general upgrade to the restrooms, interior finishes, and roof.

The existing building appears to be wood frame construction and likely supported on spread footings and slab-on-grade floors. We assume that the typical wall loads of the existing building will be approximately 1 kip per foot (dead plus live) or less. We assume that typical column loads, if utilized, will be 10 kips or less.

We assume that modifications to the existing building will be supported on conventional shallow footings.

Our recommendations are based upon the above structural and finish grade information. We should be notified if the actual loads and/or grades differ or change during the project design to either confirm or modify our recommendations. Also, when the project grading and foundation plans become available, we should be provided with a copy for review and comment.

1.3 PURPOSE OF INVESTIGATION

The primary purpose of this investigation and report is to provide an evaluation of the existing geotechnical conditions at the site as they relate to the design and construction of the proposed development. More specifically, this investigation was aimed at providing geotechnical recommendations for earthwork, and design of foundations, retaining walls, and pavements.

2.0 SCOPE OF WORK

Our scope of work included review of existing information, field investigation, laboratory testing, foundation analyses, and preparation of this report.

Our field exploration consisted of two exploratory borings, drilled using truck-mounted hollow-stem auger drilling equipment to depths of 21½ and 26½ feet below existing site grades and an additional hand auger boring extended to a depth of 6 feet below existing site grades. Details of the explorations and Logs of Borings are presented in Appendix A.

Laboratory soil tests were performed on selected representative samples as an aid in soil classification and to evaluate the engineering properties of the soils. The geotechnical laboratory testing program included determinations of moisture content and dry density, fines content, shear strength, compressibility (consolidation), maximum density/optimum moisture, and soil corrosivity. Laboratory testing procedures and results are summarized in Appendix B.

Soil corrosivity testing was performed by HDR under subcontract to GPI. Their test results are presented in Appendix B.

Engineering evaluations were performed to provide earthwork criteria, foundation and slab design parameters and assessments of seismic hazards. The results of our evaluations are presented in the remainder of the report.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The site was originally shallow lagoon or marsh areas of the Ballona Lagoon. The U.S. Army Corps of Engineers constructed the marina in the late 1950's and early 1960's. The site is currently a county facility located directly on the beach of the marina. The site contains a small wooden building surrounded by with concrete flatwork and an asphalt concrete drives and boat loading ramp. The existing building was constructed between 1963 and 1973 (Reference 1).

The subject site is bounded by Palawan Way to the north, a sand beach and boat storage to the west, a boat loading ramp, a drive, boat storage, and a sand beach to the east, and a beach and Basin D of the marina to the south. The site is relatively flat, sloping gradually downward to the south towards the beach and marina. In general, the boat ramp slopes southward from the drives to the boat wash facility at a grade of approximately 4 to 6 percent. The beach slopes downward from the drive area to the water at a grade of approximately 5 percent.

3.2 SUBSURFACE SOIL CONDITIONS

Our field investigation disclosed a subsurface profile consisting of undocumented fill soils overlying natural soils. Detailed descriptions of the conditions encountered are shown on the Boring Logs in Appendices A.

We encountered fill soils extending to depths of approximately 7½ to 8 feet below existing grades. The fills consisted of silty sands, clayey sands, sands with silt, sandy clays, and silty clays at our boring locations. The fill soils are moist to wet (saturated). In general, the fill soils are loose to medium dense. The near surface soils exhibit low expansion potential. Documentation regarding the placement and compaction of the fill soils was not provided.

The underlying natural soils consisted interbedded layers of silty clays, sandy clays, clays, clayey silts, and silty sands. The natural soil in the upper 20 to 25 feet of the soils are predominantly loose to medium dense or stiff.

In the upper 20 to 25 feet of the soil profile, the natural soils generally exhibit low to moderate strength and moderate to high compressibility.

3.3 GROUNDWATER AND CAVING

Groundwater was encountered in our exploration at depths of approximately 6 to 8 feet below the existing grade. Historical groundwater has been reported by the State at a depth as shallow as 5 feet below existing grades (Reference 2).

Caving was not observed in the small diameter hollow-stem auger boring performed. Caving of the sandy soils at the site below or just above the groundwater should be expected.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 OVERVIEW

Based on the results of our investigation, it is our opinion that from a geotechnical engineering viewpoint it is feasible to develop the site as proposed. The proposed renovations can be supported on shallow foundations. Structural mitigation measures for building foundations and slab-on-grade floors, if required for the renovations, should be implemented to help mitigate potential seismic settlements unless the associated risks are acceptable to the County.

Provided recommendations are implemented as discussed in the following sections of this report, it is our finding that the proposed project will not adversely affect the safety of the site or adjacent properties against hazard from landslide, settlement, or slippage in accordance with the Section 111 Statement of the County of Los Angeles. The proposed project will not adversely impact the stability of the site from its present condition.

The most significant geotechnical issues that will affect the design and construction of the proposed structures are as follows:

- The building can be supported on shallow footings provided remedial grading recommendations contained in this report are implemented.

- Undocumented fills below new footings, if required for the renovations, should be removed as recommended in the “Excavations” section of this report. Due to the relatively light bearing pressures anticipated for new footings , it is our opinion that the presence of undocumented fills underlying the footings at depths greater than the recommended overexcavation will not adversely impact the support of the foundations. The County will be required to accept the risk associated with the undocumented fill below recommended removals unless deeper removals and replacement below the groundwater are performed.

- The excavations for the footings at depths greater than 3 feet below existing grade may be impacted by wet clays, groundwater, and tidal fluctuations. We recommend the backfill of excavations for footings deeper than 3 feet below existing grade use clean crushed rock and filter fabric.

- The site is located in a Seismic Hazard Zone for Liquefaction. However, the Seismic Hazards Mapping Act does not apply to alterations or additions to any structure within a seismic hazard zone, which do not exceed either 50 percent of the value of the structure or 50 percent of the existing floor area of the structure. Based upon our understanding of the project, this remodel to the existing building will not meet or exceed these criteria and, as such mitigation of potential hazards is not required by the Act.

- However, we recommend that a structural mitigation measure be implemented to help mitigate potential seismic settlements for the building modifications supported on shallow foundations. Potential structural mitigation measures are provided in the "Foundations" section of the report.

- Foundation concrete should conform to requirements for severe levels of soluble sulfate exposure based on testing of the on-site soils. Resistivity testing indicates that the on-site soils are severely corrosive to metals. A corrosion engineer such as HDR should be consulted for specific corrosion recommendations with consideration to the salt water environment at the marina beach.

Our recommendations related to the geotechnical aspects of the development of the site are presented in the subsequent sections of this report.

4.2 SEISMIC CONSIDERATIONS

4.2.1 General

The site is located in a seismically active area and is likely to be subjected to strong ground shaking due to earthquakes on nearby faults. Based on published information (Reference 3), the most significant faults in the proximity of the site are the Santa Monica, Malibu Coast, Palo Verdes, and Newport Inglewood Faults, which are located about 3½ to 5 miles from the site.

We assume that the design of the proposed building remodel will be in accordance with the 2019 or 2022 California Building Code (CBC). For the 2019 or 2022 CBC, a Soil Class D may be used. Using the Site Class, which is dependent on geotechnical issues, and the appropriate SEAOC/OSHPD website (Reference 4), the corresponding seismic design parameters from the CBC are as follows:

2019/2022 CBC:

S_S = 1.86g	$S_{MS} = F_a * S_S$ = 1.86g	$S_{DS} = 2/3 * S_{MS}$ = 1.24g
S_1 = 0.66g	$S_{M1} = F_v * S_1$ = 1.12g	$S_{D1} = 2/3 * S_{M1}$ = 0.74g

The seismic design parameters above should be confirmed by the Project Structural Engineer.

In accordance with the 2019/2022 CBC, site-specific response spectra are required for structures located in a Site Class D (with S_1 greater that an equal to 0.6) unless, per the exceptions detailed in Section 11.4 8 of ASCE 7-16, the structure is designed using seismic response coefficient (C_S) determined by either:

- Equation 12.8-2 for values of $T \leq 1.5\ T_S$,
- 1.5 times the value computed by Equation 12.8-3 for values of $T_L \geq T > 1.5\ T_S$, or
- 1.5 times the value computed by Equation 12.8-4 for values of $T > T_L$.

These values should be determined by the Structural Engineer. If the exception is not taken and the structure will still be designed in accordance with the 2019/2022 CBC, GPI should be notified that a site-specific response spectra is requested.

4.2.2 Strong Ground Motion Potential

During the life of the project, the site will likely be subject to strong ground motions due to earthquakes on nearby faults. Based on the SEAOC/OSHPD website (Reference 4), we computed that the site could be subjected to a peak ground acceleration (PGA_M) of 0.88g for a magnitude 6.8 earthquake (Reference 5). This acceleration has been computed using the mapped Maximum Considered Geometric Mean peak ground acceleration from ASCE 7-16 (for 2019/2022 CBC) and a site coefficient (F_{PGA}) based on Site Class. The structural design will need to incorporate measures to mitigate the effects of strong ground motion.

4.2.3 Potential for Ground Rupture

There are no known active faults crossing or projecting through the site. The site is not located in an Alquist-Priolo Earthquake Fault Zone. Therefore, ground rupture due to faulting is considered unlikely at this site.

4.2.4 Liquefaction and Lateral Spreading

Soil liquefaction is a phenomenon in which saturated cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. In extreme cases, the soil particles can become suspended in groundwater, resulting in the soil deposit becoming mobile and fluid-like. Liquefaction is generally considered to occur primarily in loose to medium dense deposits of saturated soils. Thus, three conditions are required for liquefaction to occur: (1) a cohesionless soil of loose to medium density; (2) a saturated condition; and (3) rapid large strain, cyclic loading, normally provided by earthquake motions.

Lateral spreading is defined as the horizontal movement of soils resulting from the loss of shear strength during liquefaction combined with either a sloping ground surface or a nearby free-face condition. Conditions contributing to the potential for lateral spreading include the extent and severity of liquefaction, grain size of liquefiable materials, distance to the causative fault, and extent of surficial grade changes.

The site is located within an area mapped as having a potential for soil liquefaction, as defined by the Seismic Hazards Mapping Act (Act). As defined by the Act, characteristics of the site require investigation for the potential hazard and, if a hazard exists, that its effects be mitigated. Specifically, the site is mapped on the Seismic Hazards Zone, Venice Quadrangle (Reference 6). Based on the soil conditions throughout the marina area, there is likely a potential for liquefaction and seismic settlement during a design level earthquake in the loose to medium dense layers of sands and silty sands below groundwater.

Based on the soil conditions throughout the marina area, there is also likely a potential for lateral spreading associated with liquefaction to adversely impact the project. Methods to mitigate lateral spreading are likely cost prohibitive for the project.

As defined by the Act, characteristics of the site require investigation for the potential hazard and, if a hazard exists, that its effect be mitigated for a “Project”. The Act further states the “Project” does not include alterations or addition to any structure within a seismic hazard zone which do not exceed either 50 percent of the value of the structure or 50 percent of the existing floor area of the structure. Based upon our understanding, the remodel to the existing building will not exceed these criteria and therefore, will not require mitigation of potential hazards associated with liquefaction and lateral spreading based upon the Act.

While the Seismic Act does not require mitigation for this alteration of the existing building, the County will be required to accept the risk for potential damages to the improvements and to plan for potential repairs in the event of liquefaction or lateral spreading unless mitigation measures are implemented.

4.2.5 Seismic Ground Subsidence

Seismic ground subsidence (not related to liquefaction induced settlements) occurs when strong earthquake shaking results in the densification of loose to medium dense sandy soils above groundwater. We estimate the magnitude of subsidence for the existing sandy site soils above the groundwater to be less than ¼ inch provided remedial earthwork is performed. We estimate differential settlement due to subsidence across a span of 40 feet may be on the order of one-half the total subsidence.

4.3 EARTHWORK

The earthwork anticipated at the project site will consist of clearing and grubbing, excavation of a portion of the undocumented fills, disturbed soils, subgrade stabilization/preparation, and placement and compaction of fill.

4.3.1 Clearing and Grubbing

Prior to grading, performing excavations or constructing the proposed improvements, the areas to be developed should be stripped of vegetation and cleared of existing structures, debris, and pavements. Buried obstructions, such as footings, abandoned utilities, and tree roots should be removed from areas to be developed. Deleterious material generated during the clearing operation, including organic topsoil, should be removed from the site. If approved by the owner and regulatory agency, inert demolition debris, such as concrete and asphalt may be crushed for reuse in engineered fills outside the planned building areas in accordance with the criteria presented in the "Materials for Fill" section of this report.

4.3.2 Excavations

Excavations at this site will include removals of a portion of undocumented fills, disturbed soils, foundation excavations, and trenching for proposed utility lines.

Prior to placement of fills or construction of the foundations, a portion of the undocumented fills, and disturbed soils should be removed and replaced as properly compacted fill. These materials require densification to provide adequate support of foundations and slab-on-grade concrete.

For planning purposes, we recommend the removal/replacement for the proposed footings for the building renovations to extend to a minimum depth of 5 feet below existing grades or 2 feet below the proposed bottom of the footings, whichever is greater.

For footings of minor lightly-loaded structures outside of the building, such as small walls and trash enclosures, we also recommend the removals and replacement extend to at least 2 feet below the bottom of footings.

Undocumented fills were encountered to a depth of 7½ to 8 feet below existing grades at our explorations. Deeper fills that extend below the groundwater may be encountered during excavations for footings. Due to the relatively light bearing pressures anticipated for the building renovations, it is our opinion that the presence of undocumented fills underlying the removals for the footings will not adversely impact the support of the foundations. The County will be required to accept the minor risk associated with the undocumented fill under foundations unless deep removals and replacement below groundwater levels are performed.

For new floor slab area within the existing building, we recommend removals extend 3 feet below existing grade or bottom of slab, whichever is greater. Undocumented fills were encountered at depths greater than the recommended removals for new floor slabs. Due to the relatively low pressures of floor slab replacement, if performed, anticipated for the building renovations, it is our opinion that the presence of undocumented fills underlying the removals for the floor slabs will not adversely impact the support of the floor slab. Deeper removals to remove the undocumented fills will likely require significant costs due to the impact from groundwater and tidal fluctuations. The County will be required to accept the minor risk associated with the undocumented fill unless deep removals and replacement below groundwater levels are performed. We provide structural mitigation measures for the floor slab in “Concrete Slabs” portion of the report.

In new flatwork and pavement areas, we recommend removals extend 1-foot below existing grades.

The actual depths of removals should be determined in the field by GPI during grading.

The base of the removals should extend laterally a minimum of 2 feet beyond the edge of the footings. Prior to grading, the corners of the areas to be overexcavated should be accurately staked in the field by the project surveyor. The project surveyor should confirm

the limits of removal relative to the actual building to confirm that the recommended remedial excavations have been performed. GPI does not practice surveying; therefore, we cannot confirm lines, grades, or limits of excavations.

The excavations for the footings at depths greater than 3 feet below existing grade may be impacted by wet clays, groundwater, and tidal fluctuations. We recommend the backfill of excavations for footings deeper than 3 feet below existing grade use clean crushed rock and filter fabric as discussed in the “Material for Fill” section of this report.

The soils encountered in our exploratory boring are, in general, above optimum moisture content. The earthwork contractor should evaluate the moisture content of the existing soils when planning the required earthwork. Moisture-conditioning will be required prior to replacing the on-site soils as properly compacted fill.

Where not removed by the aforementioned excavations, existing utility trench backfill under foundations should be removed and replaced as properly compacted fill. This is especially important for deeper fills such as existing sewers and storm drains. For planning purposes, removals over the utilities should extend to within 1 foot of the top of the pipe. For utilities which are 5 feet or shallower, the removal should extend laterally 1 foot beyond both sides of the pipe. For deeper utilities, the removals should include a zone defined by a 1:1 projection upward (and away from the pipe) from each side of the pipe. The actual limits of removal will be confirmed in the field. We recommend that all known utilities be shown on the grading plan.

Temporary construction excavations may be made vertically without shoring to a depth of 4 feet below adjacent grade. For deeper cuts up to 8 feet, the slopes should be properly shored or sloped back to at least 1½:1 or flatter. Caving should be anticipated in excavations attempted in wet sands. As such, dewatering, shoring, excavation, and backfill methods should be developed by the contractor for structures or utilities that are anticipated to extend below the groundwater (including tidal flucuations). Slopes as flat as 4:1 (H:V) may be required below groundwater to enhance excavation stability. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing.

Surcharge loads should not be permitted within a horizontal distance equal to the height of cut or 5 feet from the top of the excavation, whichever is greater, unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site facilities should be properly shored to maintain support of adjacent elements. Excavations and shoring systems should meet the minimum requirements given in the State of California Occupational Safety and Health Standards.

4.3.3 Subgrade Preparation

After removals are complete and prior to placing fills or constructing of the proposed at-grade structures, the subgrade soils should be scarified to a depth of 8 inches, moisture-conditioned, and compacted to dry densities equal to at least 90 percent (95 percent for sandy soils) of the maximum dry density in accordance with ASTM D 1557.

In areas to receive pavements, the top 12 inches below the pavement base should be

compacted to a minimum of 95 percent (90 percent for clays) of the maximum dry density.

Stabilization of the subgrade using aggregate base/geogrid may be required to support heavy construction equipment or placement of fills. For stabilization with aggregate base and geogrid (Tensar BX1100 or equivalent), we expect that 12 to 18 inches of aggregate base over a geogrid will be required to provide an adequate working surface.

4.3.4 Material for Fill

Soils will be available from on-site excavations, less debris or organic matter, are suitable for re-use in fills. Retaining wall backfill, if required, should consist of on-site or imported granular (containing no more than 40 percent fines – portion passing the No. 200 sieve) and relatively non-expansive (Expansion Index of 20 or less) soils. Moisture conditioning (wetting) will be required prior to re-using some of the on-site sandy soils. Clayey soils, if encountered, should not be used within 1 foot of flatwork or as wall backfill.

Imported fill material should be predominately granular (containing no more than 40 percent fines - portion passing No. 200 sieve) and non-expansive (E.I. of 20 or less). Import or on-site materials used in compacted fills should not contain particles larger than 6 inches in diameter. GPI should be provided with a sample (at least 50 pounds) and notified of the location of soils proposed for import at least 72 hours in advance of importing. Each proposed import source should be sampled, tested and accepted for use prior to delivery of the soils to the site. Soils imported prior to acceptance by GPI may be rejected if not suitable.

Both imported and existing on-site soils, to be used as fill, should be free of debris and any pieces larger than 6 inches in greatest dimension.

For the footing excavations below a depth of 3 feet from the existing site grades, we recommend the excavations be backfilled with ¾-inch diameter clean, crushed rock material wrapped in filter fabric (Mirafi 140N or equivalent). The crushed rock should be placed in 1-foot lifts and mechanically densified.

If open-graded rock is used as backfill for other purposes at the project, the material should be placed in lifts and mechanically densified. Open-graded rock should be separated from the on-site soils by a suitable filter fabric (Mirafi 140N or equivalent).

4.3.5 Placement and Compaction of Fills

Fill soils consisting of the on-site materials should be placed in horizontal lifts, moisture-conditioned, and mechanically compacted to densities equal to at least 90 percent of the maximum dry density, determined in accordance with ASTM D1557. Fills within the upper 1 foot of pavement subgrade should be compacted to at least 95 percent (90 percent for clays) in accordance with ASTM D1557.

The optimum lift thickness will depend on the compaction equipment used and can best be determined in the field. The following uncompacted lift thickness can be used as preliminary guidelines.

Plate compactors	4-6 inches
Small vibratory or static rollers (5-ton±) or track equipment	6-8 inches
Heavy loaders or heavy vibratory rollers	8-12 inches

The maximum lift thickness should not be greater than 12 inches and each lift should be thoroughly compacted and accepted prior to subsequent lifts.

Granular fills should be placed at a moisture content of 0 to 2 percent over the optimum moisture content. Fills consisting of the on-site silts and clays, if utilized, should be placed at a moisture content of 1 to 3 percent over the optimum moisture content in order to achieve the required compaction. The moisture content of the soils encountered in the exploration was generally above the optimum moisture content. As such, moisture conditioning (drying) will be required prior to replacing the soils as properly compacted fill. Drying of the on-site clays will be difficult to achieve without thinly spreading the material during sunny and warm weather.

During backfill of excavations, the fill should be properly benched into the construction slopes as it is placed in lifts.

4.3.6 Shrinkage and Subsidence

Shrinkage is the loss of soil volume caused by compaction of fills to a higher density than before grading. Subsidence is the settlement of in-place subgrade soils caused by loads generated by large earthmoving equipment. For earthwork volume estimating purposes, an average shrinkage value of 10 to 15 percent and subsidence of 0.1 feet may be assumed for the surficial soils. These values are estimates only and exclude losses due to removal of vegetation or debris. Actual shrinkage and subsidence will depend on the types of earthmoving equipment used and should be determined during grading.

4.3.7 Trench/Wall Backfill

Utility trench and wall backfill, consisting of the on-site materials or imported sand, should be mechanically compacted in lifts. Lift thickness should not exceed those values given in the "Compacted Fill" section of this report. Moisture conditioning (drying) of the on-site soils will be required prior to re-use as backfill. Jetting or flooding of backfill materials should not be permitted. GPI should observe and test trench and wall backfills as they are placed.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain one sack of cement per cubic yard and have a maximum slump of 5 inches. Within building areas, the slurry should contain two sacks of cement per cubic yard.

4.3.8 Observation and Testing

A representative of GPI should observe excavations, subgrade preparation, and fill placement activities. Sufficient in-place field density tests should be performed during fill placement and in-place compaction to evaluate the overall compaction of the soils. Soils

that do not meet minimum compaction requirements should be reworked and tested prior to placement of additional fill.

4.4 FOUNDATIONS

4.4.1 Foundation Type

The proposed structures may be supported on conventional isolated shallow spread footings, provided the anticipated settlements are tolerable, and the subsurface soils are prepared in accordance with the recommendation provided in this report. Footings should be supported on properly compacted fill.

To help mitigate the seismic settlements (total and differential) at the site after remedial grading, the Structural Engineer should consider the following:

- Additional reinforcement in continuous footings;
- Pad footings, if utilized, tied-together-laterally with grade beams;
- Slab-on-grade floors of a minimum of 5 inches thick;
- Additional reinforcement in floor slab;
- Dowel connection between footing and floor slab.

The above items will help mitigate the potential total and differential liquefaction settlements for spread footings and slab on grade floors in the event of a design level earthquake. The actual method of structural mitigation should be determined by the Project Structural Engineer.

Minor structures such as signs, minor retaining walls and screen walls may also be supported on lightly loaded spread footing.

4.4.2 Shallow Foundations

Based on the shear strength and elastic settlement characteristics of the natural and recompacted on-site soils, static allowable net bearing pressures of up to 1,500 pounds per square foot (psf) may be used for both continuous footings and isolated column footings for the proposed building renovation or other lightly-loaded structures.

These bearing pressures are for dead-load-plus-live-load, any may be increased one-third for short-term, transient, wind and seismic loading. The actual bearing pressure used may be less than the value presented above and can be based on economics and structural loads to determine the minimum width for footings as discussed below. The maximum edge pressures induced by eccentric loading or overturning moments should not be allowed to exceed these recommended values.

A minimum footing width of 15 inches should be used even if the actual bearing pressure is less than 1,500 psf. The minimum footing embedment refers to minimum depth below lowest adjacent grade at the time of foundation construction.

Total static settlement of the wall footings (1 kip per lineal foot maximum load) or column

loads (10 kips or less) is expected to be on the order of ½-inch or less. Maximum differential settlements between similarly loaded adjacent footings or along a 40-foot span are expected to be on the order of ¼-inch or less. Similar settlements are anticipated for lightly loaded structures supported on 2 feet of properly compacted fill.

The above settlements do not include the anticipated seismic settlement caused by liquefaction when evaluating the total settlement of the building or other lightly loaded structures.

The above estimates are based on the assumption that the recommended earthwork will be performed and that the footings will be sized in accordance with our recommendations.

4.4.3 Lateral Load Resistance

Soil resistance to lateral loads will be provided by a combination of frictional resistance between the bottom of footings and underlying soils and by passive soil pressures acting against the embedded sides of the footings. For frictional resistance, a coefficient of friction of 0.35 may be used for design. In addition, an allowable lateral bearing pressure equal to an equivalent fluid weight of 275 pounds per cubic foot may be used, provided the foundation are poured tight against the compacted fill. These values may be used in combination without reduction.

4.4.4 Foundation Concrete

Laboratory testing by HDR (Appendix B) indicates that the near surface soils exhibit a soluble sulfate content of 4,580 mg/kg (0.458 percent by weight). For the 2019/2022 CBC, foundation concrete should conform to the requirements outlined in ACI 318, Section 4.3 for severe levels of soluble sulfate exposure from the on-site soils, (Category S2). For concrete exposed to soil moisture, such as footings and floor slabs, we recommend a chloride Category C2

4.4.5 Foundation Excavation Observation

Prior to placement of concrete and steel, a representative of GPI should be observe and approve all foundation excavations.

4.5 LATERAL EARTH PRESSURES

The recommendations below are provided for relatively short walls, retaining no more than 5 feet and conventionally backfilled with free draining granular soils. It is our understanding that basements are not planned as part of the proposed building renovation.

Active earth pressures can be used for designing walls that can yield at least ½-inch laterally in 10 feet under the imposed loads. For cantilever walls with level backfill comprised of granular drained soils, the magnitude of active pressures are equivalent to the pressures imposed by a fluid weighing 35 pounds per cubic foot (pcf). This pressure may also be used for the design of temporary shoring excavation support, if required.

For restrained walls that remain rigid enough to be essentially non-yielding, an at-rest pressure of 52 pcf may be used for design.

Walls subject to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge pressure for unrestrained and restrained walls, respectively.

The wall backfill should be well-drained to relieve possible hydrostatic pressure or designed to withstand these pressures. A drain consisting of perforated pipe and gravel wrapped in filter fabric should be used. One cubic foot of rock should be used for each lineal foot of pipe. The fabric (non-woven filter fabric, Mirafi 140N or equivalent) should be lapped at the top. We prefer pipe and gravel drains rather than weep holes to avoid potential for constant flow of surface water in front of the wall.

The Structural Engineer should specify the use of select, granular wall backfill on the plans. Wall footings should be designed as discussed in the "Foundations" section.

4.6 CONCRETE SLABS

Slab on grade floors should be supported on granular, non-expansive soils (Expansion Index less than 20) compacted as discussed in the “Placement and Compaction of Fill” section. Clayey soils should not be used in the upper 1 foot of the pad for the building renovation. Based on our explorations, granular, non-expansive soils are readily available on-site.

To help mitigate potential impacts of undocumented fills left below the engineered fill underlying the floor slab, we recommend a layer of geogrid (Tensar BX1100 or equivalent) be placed at the base of the recommended removals for floor slab. A 12-inch layer of aggregate base compacted to at least 95 percent of maximum dry density in accordance with ASTM D-1557 should be placed over the geogrid. This layer of geogrid and aggregate base will also help to mitigate potential liquefaction settlement as well as providing an adequate working surface for compaction of the overlying fill. The structural mitigation recommendations for potential liquefaction impacts to the floor slab to be considered by the Project Structural Engineer as described in the “Foundations” section of this report will also help mitigate potential impacts of not removing undocumented fills below the groundwater.

A vapor/moisture retarder should be placed under slabs that are to be covered with moisture-sensitive floor coverings (parquet, vinyl tile, etc.) or will be storing moisture sensitive supplies. Currently, common practice is to use a 15-mil polyolefin product such as Stego Wrap for this purpose. The need or a sand layer with the vapor barrier is not a geotechnical issue and is a decision for the Project Architect.

It should be noted that the material used as a vapor retarder is only one of several factors affecting the prevention of moisture accumulation under floor coverings. Other factors include maintaining a low water to cement ratio for the concrete used for the floor slab, effective sealing of joints and edges (particularly pipe penetrations), and excess moisture in the concrete. The manufacturer of the floor coverings should be consulted for establishing acceptable criteria for the condition of floor surface prior to placing moisture-sensitive floor

coverings.

For lateral resistance design, a coefficient of friction value of 0.35 between select fill and concrete may be used. For a slab on a visqueen moisture barrier, a coefficient of 0.1 should be used.

The structural mitigation recommendations for potential liquefaction impacts to the floor slab to be considered by the Project Structural Engineer as described in the "Foundations" section of this report will also help mitigate potential impacts of not removing undocumented fills below the groundwater.

4.7 CORROSIVITY

Resistivity testing of a representative sample of the on-site soils indicates that they are severely corrosive to ferrous metals. A corrosion engineer such as HDR should be consulted for specific corrosion recommendations with consideration to the salt water environment at the marina beach.

4.8 SURFACE DRAINAGE

Positive surface gradients should be provided adjacent to structures so as to direct surface water run-off and roof drainage away from foundations and slabs toward suitable discharge facilities. Long-term ponding of surface water should not be allowed on pavements, flatwork, concrete slabs, or adjacent to buildings.

4.9 STORMWATER INFILTRATION

Current regulations require that storm water be infiltrated in the site soils when possible. The soil types and groundwater depth present at the site control the ability of water to infiltrate into the subgrade. Based upon our subsurface investigation, groundwater was encountered in the upper 6 to 8 feet of the soil profile, historical high groundwater is a depth of 5 feet, and the site is located in a liquefaction zone. In addition, the subsurface soils at depths of approximately 5 feet or less predominantly of clays which have poor infiltration characteristics and are not suitable to accept infiltration. For the above reasons, storm water infiltration is not feasible for the subject site.

4.10 EXTERIOR CONCRETE AND MASONRY FLATWORK

Exterior concrete or masonry pedestrian flatwork and concrete pavers should be supported on non-expansive compacted fill. The use of clayey soils, if encountered at the site, is not recommended within one foot of the flatwork subgrade. Prior to placement of concrete, the subgrade should be prepared as recommended in "Subgrade Preparation" section.

The concrete hardscape, stairs, flatwork, sidewalks, and pavers should be underlain by at least 4 inches of crushed aggregate base (CAB). Base course materials should be compacted to at least 95 percent of the maximum dry density (ASTM D1557). Aggregate base should conform to the requirements of Section 200-2 of the Standard Specifications for Public Works Construction (Green Book) for crushed aggregate base (CAB) or

crushed miscellaneous base (CMB) materials.

We recommend that concrete pavers have a minimum thickness of 60 mm (2.375 inches) for pedestrian applications in accordance with Interlocking Concrete Pavement Institute (ICPI), Tech Spec 10 (ICPI, 1999). We recommend that the pavers be placed on 25 mm (1 inch) thick of bedding sand in accordance. The bedding sand for concrete pavers should be in accordance with the gradation provided in ASTM C-33. Mason sand should not be used as bedding because it can be slow draining and unstable. Bedding sand or mason sand may be used in the joints between pavers. Mason sand should be in accordance with the gradation provided in ASTM C-144. Installation of the pavers should be in accordance with the guidance in ICPI, 1999. We do not recommend a maintenance program with high pressure washing of the pavers be implemented unless a stabilized joint sand is used for the pavers.

4.11 PAVED AREAS

Preliminary pavement design has been based on an assumed R-value of 20, which is consistent with the on-site soils near the ground surface. The California Division of Highways Design Method was used for design of the recommended preliminary pavement sections. These recommendations are based on the assumption that the pavement subgrades will consist of the existing silty sand or sand soils encountered near the ground surface.

PAVEMENT AREA	TRAFFIC INDEX	SECTION THICKNESS (inches)	
		PAVEMENT	AGGREGATE BASE COURSE
Flexible Auto Parking Stalls	4	**Asphalt Concrete** 3	5
Circulation Drives (No Trucks)	5	3	8
Truck Driveways	6	3	11
Rigid Auto, Fire, and Circulation	4 to 5	**Portland Cement Concrete** 6½	4
Truck Driveways	6	7	4

The pavement subgrade underlying the aggregate base should be properly prepared and compacted in accordance with the recommendations outlined under "Subgrade Preparation".

If vehicular pavers are to be used for the project, the paver and leveling sand may be supported on the thickness of aggregate base shown above for the appropriate traffic index.

The concrete used for paving should have a modulus of rupture of at least 570 psi (equivalent to an approximate compressive strength of 3,500 psi) at the time the pavement is subjected to traffic.

The pavement base course should be compacted to at least 95 percent of the maximum dry density (ASTM D 1557). Aggregate base should conform to the requirements of Section 26 of the California Department of Transportation Standard Specifications for Class II aggregate base (three-quarter-inch maximum) or Section 200-2 of the Standard Specifications for Public Works Construction (Green Book) for untreated base materials (except Processed Miscellaneous Base).

The above recommendations are based on the assumption that the base course will be properly drained. The design of paved areas should incorporate measures to prevent moisture build-up within the base course and subgrade, which can otherwise lead to premature pavement failure. For example, curbing adjacent to landscaped areas should be deep enough to act as a barrier to infiltration of irrigation water into the adjacent base course.

4.12 GEOTECHNICAL OBSERVATION AND TESTING

We recommend that a representative of GPI observe all earthwork during construction to confirm that the recommendations provided in our report are applicable during construction. The earthwork activities include grading, compaction of fills, subgrade preparation, pavement construction and foundation excavations. If conditions are different than expected, we should be afforded the opportunity to provide an alternate recommendation based on the actual conditions encountered.

5.0 LIMITATIONS

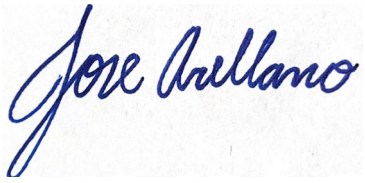
This report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by the County of Los Angeles, Department of Public Works and their consultants in designing the proposed redevelopment of the site. The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on project other than the currently proposed development as it may not contain sufficient or appropriate information for such uses.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided by GPI during grading, excavation, and foundation construction. If field conditions during construction appear to be different than is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If construction phase services are performed by others, the client and new geotechnical firm must accept full responsibility for all geotechnical aspects of the project, including this report.

Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical engineers practicing in this area. No other representation, either expressed or implied, is included or intended in our report.

Respectfully submitted,
Geotechnical Professionals Inc.







Jose Arellano, E.I.T.
Staff Engineer

Donald A. Cords, G.E.
Principal

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BASE MAP REPRODUCED FROM CALTOPO © 2022

GPI GEOTECHNICAL PROFESSIONALS, INC.

SITE LOCATION MAP

MOTHERS BEACH BOAT FACILITY

GPI PROJECT NO.: 3080.23I

SCALE: 1" = 1000'

FIGURE 1



EXPLANATION

B-3 APPROXIMATE LOCATION AND NUMBER OF PROPOSED EXPLORATORY BORING

N

0 50 100 FEET

BASE MAP REPRODUCED FROM GOOGLE EARTH © 2022

GPI GEOTECHNICAL PROFESSIONALS, INC.

MOTHERS BEACH BOAT FACILITY

GPI PROJECT NO.: 3080.23I | SCALE: 1" = 50'

SITE PLAN

FIGURE 2

APPENDIX A

APPENDIX A

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling two exploratory borings and one hand auger. The borings were advanced below the existing ground surface to depths ranging from 21½ to 26½ feet and 6 feet for the hand auger. The locations of the explorations are shown on the Site Plan, Figure 2.

The exploratory borings were drilled using truck-mounted hollow-stem auger drill equipment and hand auger equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D 3550). The brass-rings have an inside diameter of 2.42 inches. The ring samples were driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler into the soil was recorded as the penetration resistance.

At selected depths, disturbed samples were obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches. After an initial seating drive of 6 inches, the number of blows needed to drive the sampler into the soil a depth of 12 inches was recorded as the penetration resistance. These values are the raw uncorrected blowcounts.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings and hand-auger are presented in Figures A-1 to A-3 in this appendix.

The exploration locations were laid out in the field by measuring from existing site features. Ground surface elevations at the exploration locations were estimated using Google Earth.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	7-INCH AC OVER 7-INCH BASE	
14.4		42	D		Fill: **SILTY SAND (SM)** brown to dark brown, moist to very moist, medium dense, trace clay, trace gravel,	10
			B			
14.8	106	20	D		pieces of brick in spoils, pieces of concrete in sample	
					CLAYEY SAND (SC) brown, moist, medium dense	
20.1	98	37	D	5	**SILTY SAND (SM)** brown, wet	
14.6	103				**SILTY CLAY (CL)** dark brown, moist, very stiff, trace sand	5
64.1	62	10	D			
21.4	84				Natural: **CLAYEY SILT (ML)** grey, wet, firm	
36.6	79	18	D	10	**CLAY (CL)** dark brown, wet, stiff	0
34.9		5	S	15	**SILTY SAND (SM)** grey, wet, very loose, trace shells, trace clay, fine to coarse sand	-5
27.1	97	16	D	20	**CLAYEY SILT (ML)** grey brown, wet, stiff	-10
14.9		27	S	25	**SILTY SAND (SM)** grey brown, wet, medium dense, with gravel	
					Total Depth 26.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-12-22

EQUIPMENT USED: 8 " HSA

GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 3080.23I

MOTHERS BEACH

LOG OF BORING NO. B-1

FIGURE A-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	*DESCRIPTION OF SUBSURFACE MATERIALS*	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	5-INCH CONCRETE OVER NO BASE	
14.8	110	18	D		Fill: **SAND WITH SILT (SP-SM)** light brown, very moist, medium dense	
21.5	104				**SANDY CLAY (CL)** dark brown, very moist, stiff	5
17.2	108	12	D	5	@ 4 feet, moist	
		52	D		@ 6 feet, no recovery, hard	
25.8	96	22	D		Natural: **SILTY SAND (SM)** grey, wet, medium dense	0
31.3		11	S	10		
						-5
26.9	98	19	D	15	**SANDY CLAY (CL)** grey, wet, stiff	
						-10
10.0		9	S	20	**SILTY SAND (SM)** brown grey, moist, loose	
					Total Depth 21.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-12-22

EQUIPMENT USED: 8 " HSA

GROUNDWATER LEVEL (ft): 6

GPI

PROJECT NO.: 3080.23I

MOTHERS BEACH

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	*DESCRIPTION OF SUBSURFACE MATERIALS*	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0		
12.7			B		Fill: **SILTY SAND (SM)** brown to light brown, moist to very moist	
14.9			B			
22.4			B		**CLAYEY SAND (SC)** brown, very moist	5
24.9			B			
30.2			B	5	**SILTY CLAY (CL)** dark brown grey, wet, trace gravel	
					Total Depth 6 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 9-12-22

EQUIPMENT USED: HA

GROUNDWATER LEVEL (ft): 6

GPI

PROJECT NO.: 3080.23I

MOTHERS BEACH

LOG OF BORING NO. B-3

FIGURE A-3

APPENDIX B

APPENDIX B

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from a number of the ring samples. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix A.

GRAIN SIZE DISTRIBUTION

Selected soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-1	3	Clayey Sand (SC)	38
B-2	10	Silty Sand (SM)	20

DIRECT SHEAR

Direct shear tests were performed on drive and remolded samples in accordance with ASTM D 3080. The test specimens were placed in the shear machine, and a normal load comparable to the in-situ overburden stress was applied. The samples were inundated, allowed to consolidate, and then were sheared to failure at a strain rate of 0.001 or 0.0021inches per minute for fine-grained and sandy soils, respectively. The tests were repeated on additional test specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the test. The results of the direct shear tests are presented in Figures B-1 through B-2.

CONSOLIDATION

One-dimensional consolidation tests were performed on undisturbed samples in accordance with ASTM D 2435. After trimming the ends, the samples were placed in the consolidometer and loaded to up to 0.4 ksf. Thereafter, the samples were incrementally loaded to a maximum load of up to 12.8 ksf. The samples were inundated at 1.6 ksf. Sample deformation was measured to 0.0001 inch. Rebound behavior was investigated by unloading the sample back to 0.4 ksf. Results of the consolidation tests, in the form of percent consolidation versus log pressure are presented in Figure B-1.

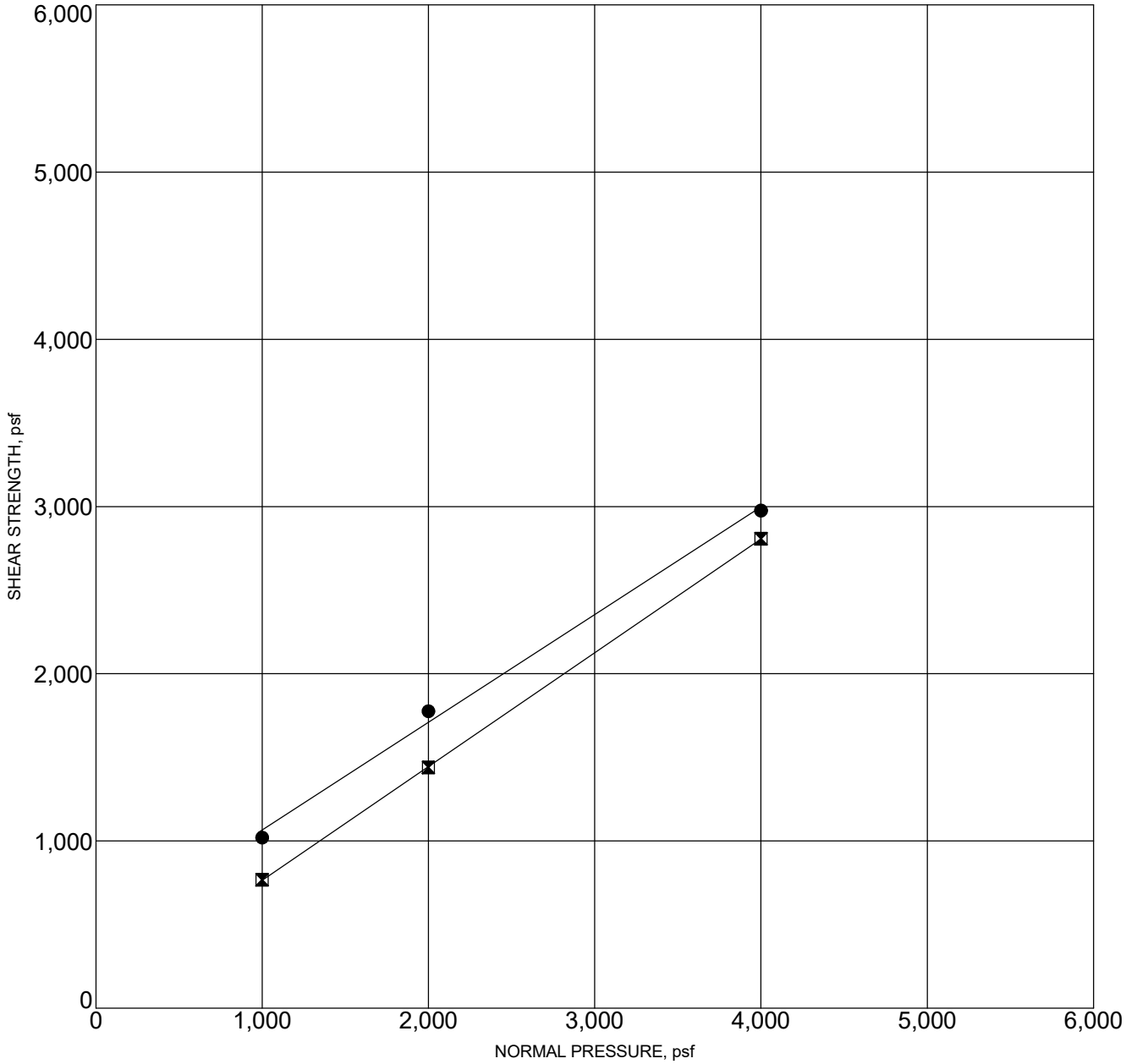
COMPACTION TEST

A maximum dry density/optimum moisture test was performed in accordance with ASTM D 1557 on a representative bulk sample of the site soils. The test results are:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)
B-1	0 – 5	Clayey Sand (SC)	118	12.5

CORROSIVITY

Soil corrosivity testing was performed by HDR Schiff on a soil sample provided by GPI. The test results are summarized in Table 1 of this Appendix.



● **PEAK STRENGTH**
Friction Angle= 33 degrees
Cohesion= 420 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 34 degrees
Cohesion= 84 psf

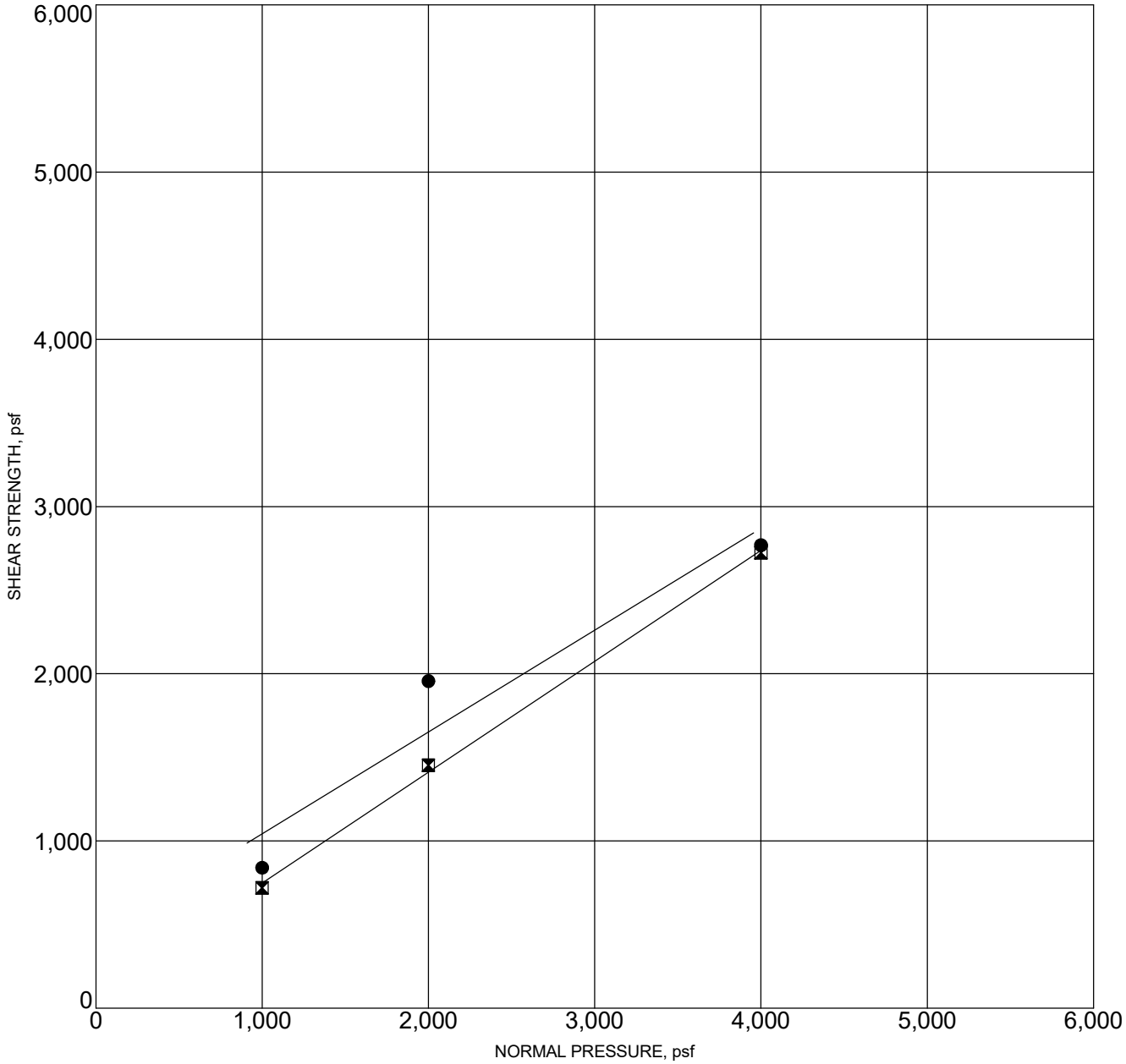
Sample Location		Classification	DD,pcf	MC,%
B-2	4.0	SANDY CLAY (CL)	108	17.2

PROJECT: MOTHERS BEACH PROJECT NO.3080.23I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE B-1



● **PEAK STRENGTH**
Friction Angle= 31 degrees
Cohesion= 434 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 34 degrees
Cohesion= 84 psf

Note: Samples remolded to 90% of maximum dry density

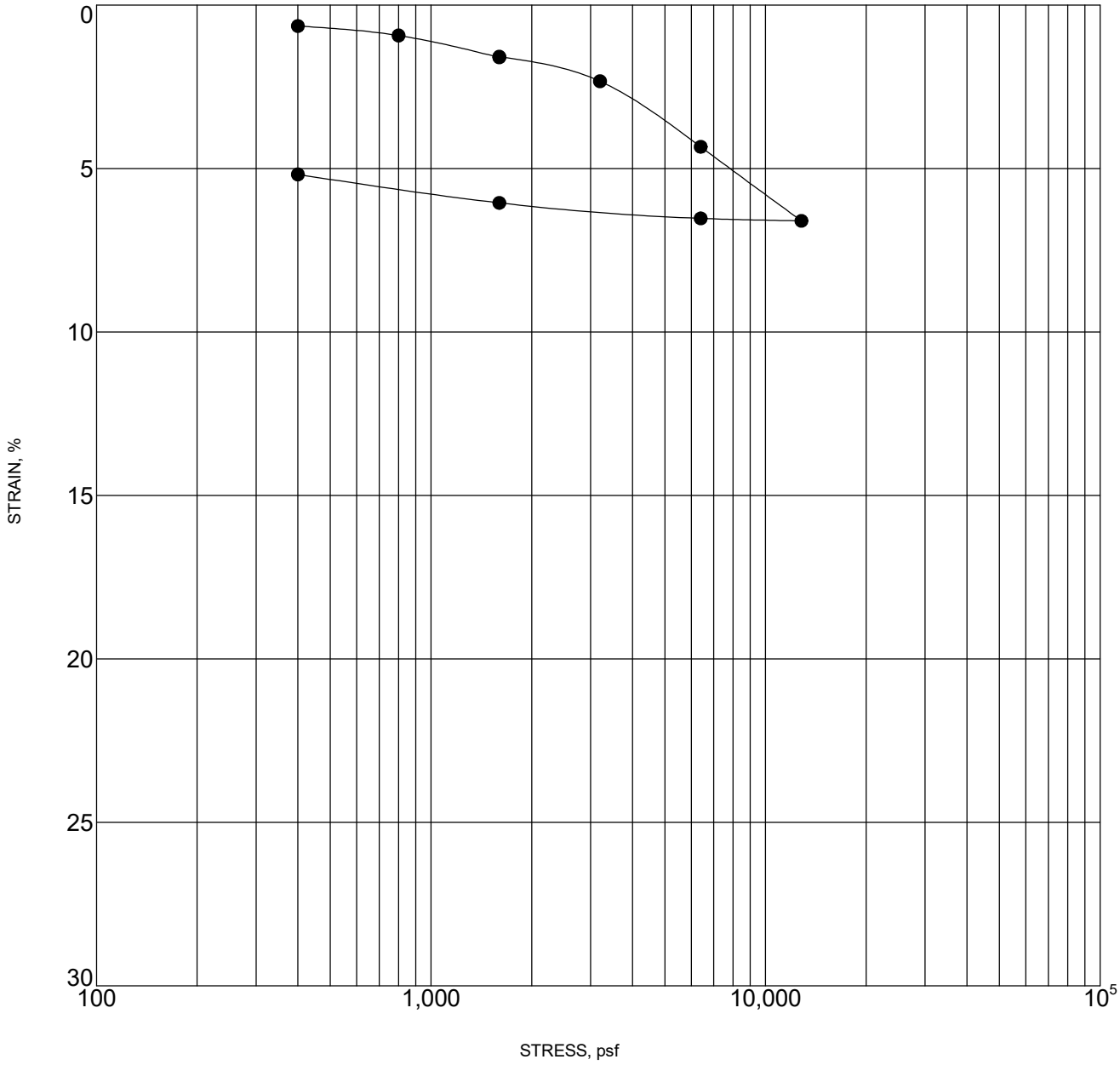
Sample Location		Classification	DD,pcf	MC,%
B-1	0-5	CLAYEY SAND (SC)	106	12.5

PROJECT: MOTHERS BEACH PROJECT NO.3080.23I

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DIRECT SHEAR TEST RESULTS

FIGURE B-2



Sample inundated at 1600 psf

	Sample Location		Classification	DD,pcf	MC,%
●	B-1	5.0	SANDY CLAY (CL)	98	20.1

PROJECT: MOTHERS BEACH PROJECT NO.: 3080.23I

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CONSOLIDATION TEST RESULTS

FIGURE B-3

Table 1 - Laboratory Tests on Soil Samples

Geotechnical Professionals, Inc.
Mother's Beach
Your #3080.23I, HDR Lab #22-0939LAB
5-Oct-22

Sample ID			
			B-1 @ 0-5'
Resistivity		**Units**	
as-received		ohm-cm	1,000,000
saturated		ohm-cm	680
pH			7.8
Electrical Conductivity		mS/cm	1.68
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	1,060
magnesium	Mg^{2+}	mg/kg	27
sodium	Na^{1+}	mg/kg	704
potassium	K^{1+}	mg/kg	115
ammonium	NH_4^{1+}	mg/kg	ND
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	281
fluoride	F^{1-}	mg/kg	4.0
chloride	Cl^{1-}	mg/kg	423
sulfate	SO_4^{2-}	mg/kg	4,580
nitrate	NO_3^{1-}	mg/kg	257
phosphate	PO_4^{3-}	mg/kg	ND
Other Tests			
sulfide	S^{2-}	qual	na
Redox		mV	na

Resistivity per ASTM G187, pH per ASTM G51, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.

Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.

mg/kg = milligrams per kilogram (parts per million) of dry soil.

Redox = oxidation-reduction potential in millivolts

ND = not detected

na = not analyzed

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GEOTECHNICAL PROFESSIONALS INC.

July 22, 2024

County Los Angeles
Department of Public Works
Project Management Division I
900 S. Fremont Avenue, 5th Floor
Alhambra, CA 91803

Attention: Mr. Salim Sioufi, P.E., C.C.M.
Senior Project Manager

Subject: Update of Geotechnical Investigation Report
Mother's Beach Non-Motorized Boat Facility Project
14010 Palawan Way
Marina del Rey, California
GPI Project No. 3080.23I
Los Angeles County/GPI Contract PW 15556
Project ID 00001833, Project P96242HR

This report update letter is in response to a comment provided by Los Angeles County Building and Safety on our Response to Structural Engineer Comments dated January 15, 2024 (GPI, 2024). Specifically, there are currently project features proposed that were not addressed in our Geotechnical Investigation Report (GPI, 2022) or Response Letter. The report review comment is provided as follows:

"Geotech addendum response #3 permits the use of drilled pole footings for minor structures only. The pole footings in this project provide lateral resistance to the building structure. Revise addendum to include design parameters for pole footing used as LFRS."

Background

Based on the proposed structural Foundation Plan by VCA Engineers, Inc. dated June 10, 2024, the canopy for the proposed structure will be supported on 36-inch diameter drilled pier foundations. We understand that axial loads for each of the six columns will be on the order of 10 kips or less and that axial loads will govern the design length of the drilled pier foundations.

Our response letter only addressed pole foundations for minor structures such as light standards, bollards and fences. As such, this letter report consists of an update to recommendations in our geotechnical investigation report to reflect the drilled pier foundations for the proposed building structure.

The recommendations contained in our referenced report and response letter remain valid except as specifically modified below.

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Drilled Pier Foundations

Axial Capacity

Drilled pier foundations will develop their frictional capacity with relatively small deflection (less than ½ inch). The allowable capacities will depend on the drilled pier diameter and the total depth of embedment below the finished grade. The drilled pier design parameters shown below do not include capacity for end bearing, as it is difficult to adequately clean the base of small diameter drilled shafts. The values presented are for static loads and can be increased by one-third for short term wind and seismic loads.

Based upon the results of our subsurface explorations and laboratory testing, the parameters shown in the following tables may be used for axial design of drilled pier foundations. We utilized a factor of safety of 2 to determine the allowable skin friction values.

Recommended Design Parameters - Axial

Embedment Below Finished Grade (feet)	Allowable Skin Friction (psf)
0 to 3	75
3 to 8	300
>8	1,000

The allowable uplift capacity for a given drilled pier may be taken as one-half of the compressive capacity calculated using the parameters provided below. The Structural Engineer may also utilize the weight of the pier foundation to resist uplift loads.

Settlement

Total static settlement of the canopies supported on drilled piers as recommended is anticipated to be ½ inch or less. Differential settlement between similarly loaded adjacent piers is anticipated one-half of the total static settlement or less. The above estimates are based on the assumption that the drilled piers will be sized and installed in accordance with our recommendations.

Lateral Resistance

Resistance to lateral loads can be provided by the piers and adjacent soils. For design by the simplified pole formula presented in Section 1807A.3.2.1 of the 2022 California Building Code, a unit passive resistance of 250 pounds per square foot per foot (to a maximum of 2,500 psf) may be used for the pole footings with level ground in lieu of the presumptive lateral bearing values presented in Table 1806A.2. As stated in the code, the above passive resistance may be doubled (500 pounds per square foot, up to a maximum of 5,000 pounds per square foot) for isolated piles as determined by the Project Structural Engineer. This value incorporates the allowable increase stated in section 1806A.3.4 of the code for single poles that can tolerate ½ inch of deflection under short-term loads.

Installation

Since the drilled piers will be designed to derive resistance from friction only, rigorous cleaning of loose material from the bottom of the excavation prior to placement of steel and concrete is not considered essential. However, effort should be made to clean the bottom with the drill rig mounted equipment.

The drilled pier contractor should evaluate the potential drilling conditions when planning the installation methods. Based on our explorations, we anticipate groundwater will likely be encountered during the installation of the pier footings. Based on groundwater depth, tidal fluctuations, and the density/moisture of the soils encountered in the upper 10 feet, the caving potential in large diameter excavations of the sandy soil layers and soils below or near the groundwater level is anticipated to be high. The caving potential of clayey soils above groundwater considered to be low to moderate. If caving soil conditions are encountered, we anticipate the contractor will need to utilize casing, slurry, or other methods to maintain the pier excavation within the caving soil layers. In addition, caving soils will increase the required volume of concrete for the pier foundation.

Pier excavations should be filled with concrete on the same day they are drilled. The concrete should be placed with special equipment so that it is not allowed to fall freely more than 10 feet or strike the walls of the excavations. The piers should be poured in a manner that will prevent segregation of aggregate. The compressive strength of concrete placed in pier excavations extending below the groundwater level should be increased by at least 1,000 psi from the design strength required by the Structural Engineer. Drilled pier construction should be performed in accordance with the latest edition of ACI 336.1, “Standard Specifications for the Construction of Drilled Piers.”

Downhole inspection of drilled pier excavations (by lowering an inspector into the excavation) is not required since the piers are designed as frictional elements. However, pier excavations should be observed by a representative of GPI to confirm and document the depth, diameter, and embedment in suitable materials.

Closing

Our evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either express or implied, is included or intended in our report.

The opportunity to be of service is appreciated. Please call if you have questions.

Very truly yours,
Geotechnical Professionals Inc.




Patrick I.F. McGervey, G.E.
Senior Engineer




Donald A. Cords, G.E.
Principal

REFERENCES

Geotechnical Professionals Inc., “Geotechnical Investigation, Proposed Outdoor Boat Wash and Building Renovations, Mother’s Beach Non-Motorized Boat Facility Project, 14010 Palawan Way, Marina del Rey, California,” GPI Project No. 3080.23I, dated October 17, 2022.

Geotechnical Professionals Inc., “Response Letter to Structural Engineer Comments, Mother’s Beach Non-Motorized Boat Facility Project, 14010 Palawan Way, Marina del Rey, California,” GPI Project No. 3080.23I, dated January 12, 2024.

APPENDIX B

GEOTECHNICAL RESPONSE LETTER

GEOTECHNICAL PROFESSIONALS INC.

January 15, 2024

County Los Angeles
Department of Public Works
Project Management Division I
900 S. Fremont Avenue, 5th Floor
Alhambra, CA 91803

Attention: Mr. Salim Sioufi, P.E., C.C.M.
Senior Project Manager

Subject: Response Letter to Structural Engineer Comments
Mother's Beach Non-Motorized Boat Facility Project
14010 Palawan Way
Marina del Rey, California
GPI Project No. 3080.23I
Los Angeles County/GPI Contract PW 15556
Project ID 00001833, Project P96242HR

This letter is in response to the geotechnical report review comments by the Project Structural Engineer regarding our geotechnical report dated October 17, 2022 (Reference). The report review comments prepared by the Project Structural Engineer and our responses are provided as follows:

Comment No. 1: *On page 5 of the soils report it says that Liquefaction study is not required for "…alterations or additions to any structure within a seismic hazard zone, which do not exceed either 50 percent of the value of the structure or 50 percent of the existing floor area of the structure." I think we are exceeding this threshold. Should a Liquefaction study be provided by the soils engineer?*

Response No. 1: If a liquefaction study is determined to be necessary, we propose to utilize existing deep cone penetration tests from the adjacent Mothers Beach site performed by GPI in 2014. The data from that site is typical of the perimeter of the basins at Marina del Rey.

The site is located within a zone identified as having a potential for liquefaction by the State (CDMG, 1999). We utilized a cone penetration test performed by GPI for the County (GPI 2014) along the boardwalk of the marina at a distance of approximately 750 feet from the project site.

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We evaluated the potential for liquefaction using the methods presented in Robertson, 2009 and modifications provided in Special Publication 117A. We considered the mapped ground acceleration (PGA_M) of 0.88g, a mean magnitude 6.8 earthquake, and a historical high groundwater level of 5 feet below existing grades.

Our analysis indicated that interbedded layers of silty sands and sandy silts between the depths of approximately 6 to 30 feet have the potential to liquefy during a design level earthquake. Should liquefaction of these subsurface soils occur, we estimate the magnitude of liquefaction induced settlement would be on the order of 1½ to 2 inches. Differential settlement across 40 feet would be on the order of ¾ to 1 inch.

The liquefaction potential and resulting settlement are typical of project sites located along the basins of Marina del Rey. Ground improvement to depths of at least 30 feet below existing grade would be required to mitigate the potential for liquefaction. Pile foundations could also be utilized to extend foundations to at least 15 feet below the liquefiable layers. Neither alternative is likely to be economically feasible for this relatively small building addition and renovation.

Comment No. 2: *Following up on our 1st question, on page 14 of the soils report it says that "…settlements do not include the anticipated seismic settlement caused by liquefaction when evaluating the total settlement of the building or other lightly loaded structures." Should the additional settlements be provided and any additional requirements?*

Response 2: Seismic settlements at the site will result from the liquefaction settlement during a design earthquake event. We estimate the magnitude of seismic-induced settlement would be on the order of 1½ to 2 inches. Differential seismic settlement across 40 feet would be on the order of ¾ to 1 inch.

We recommend that the Structural Engineer should consider the items below to help mitigate the seismic settlements (total and differential) in addition to the static settlement at the site after remedial grading:

- Additional reinforcement in continuous footings;
- Pad footings, if utilized, tied-together-laterally with grade beams;
- Slab-on-grade floors of a minimum of 5 inches thick;
- Additional reinforcement in floor slab;
- Dowel connection between footing and floor slab.

The above items will help mitigate the potential total and differential liquefaction settlements and lessen potential damage for spread footings and slab on grade floors in the event of a design level earthquake. Another potential option would be to support the addition on a mat foundation system. The actual method of structural mitigation should be determined by the Project Structural Engineer.

Comment No. 3: *We need lateral and vertical design parameters for pole footings. Please have the soils engineer provide design values for pole footings, both for lateral and vertical capacities.*

Response No. 3: Minor structures such as light standards, bollards, small signs, and fences may be supported on drilled pole footings. The design of such pole footings is typically governed by lateral loading conditions. Soil resistance to lateral loads can be provided by the pole footing. For design by the simplified pole formula presented in Section 1807A.3.2.1 of the 2022 CBC, a unit passive resistance of 250 pounds per square foot per foot (to a maximum of 2,500 pounds per square foot) may be used for the pole footings with level ground in lieu of the presumptive lateral bearing values presented in Table 1806A.2. As stated in the code, the above passive resistance may be doubled (500 pounds per square foot per foot, up to a maximum of 5,000 pounds per square foot) for isolated piles as determined by the Project Structural Engineer. This value incorporates the allowable increase stated in Section 1806A.3.4 of the code for single poles that can tolerate a ½ inch of deflection under short-term loads.

We recommend the upper 2 feet of the subgrade soils be ignored in determining the required depth of embedment for lateral capacity to account for the presence of shallow undocumented fills and to allow for surface erosion/disturbance adjacent to the pole. We should note that Section 1807A.3.2.1 of the 2022 CBC pertains to non-constrained pole footings (i.e., free head conditions). For constrained pole footings (i.e., fixed head conditions), the formula presented in Section 1807A.3.2.2 should be used.

A pole designed for adequate embedment to resist the anticipated lateral loads for minor structures such as light standards, bollards, small signs, and fences should have adequate axial capacity to support the anticipated vertical loads. However, if needed, the net allowable vertical compressive capacity can be conservatively calculated based on a unit skin friction of 75 pounds per square foot, neglecting end-bearing contribution. Similar to lateral capacity, we recommend that the upper 2-feet of the subgrade soils be ignored in determining the required depth of embedment for axial capacity to account for the presence of shallow undocumented fills and allow for future erosion/surface disturbance adjacent to the pole footing.

We utilized a factor of safety of 3 to determine the allowable skin friction values provided above. The settlement of the drilled pole footings designed using the above allowable skin friction values is anticipated to be less than ½ inch.

The uplift capacity of the pole footing may be taken as one-half of the downward capacities derived from skin friction only.

If the ground surface surrounding the pole is paved with concrete or asphalt concrete, the lateral and skin friction resistance of the upper 2-feet of the subgrade soils can be used in determining the required depth of embedment.

The Contractor should evaluate the potential drilling conditions when planning installation methods for pole footings. Based on groundwater depth, tidal fluctuations, and the density/moisture of the soils encountered in the upper 10 feet, the caving

potential in large diameter excavations of the soils is anticipated to be high in layers of sandy soils and low to moderate in the clayey soils. If caving soil conditions are encountered, casing, slurry, or other methods should be utilized to maintain the pole footing excavation. In addition, caving soils would increase the required volume of concrete. Based on our explorations, we anticipate groundwater may be encountered during the installation of the pole footings depending on the tidal levels at the time of the excavation.

Pole footings should be filled with concrete on the same day that they are drilled. The concrete should be placed with special equipment so that it is not allowed to fall freely more than 5 feet or strike the walls of the excavations. Drilling should not be performed within 5 feet of recently excavated or recently poured pole footings until the concrete has been allowed to set for at least 6 hours.

We trust these responses address the concerns of the Project Structural Engineer. Please feel free to contact us if you have any questions.

Very truly yours,
Geotechnical Professionals Inc.

Jose Arellano, E.I.T.
Staff Engineer

Donald A. Cords, G.E.
Principal



References

California Division of Mines and Geology, “Seismic Hazard Zone Report for the Venice 7.5-minute Quadrangle, Los Angeles County, California,” Seismic Hazard Zone Report 036, 1998.

Geotechnical Professionals Inc., “Geotechnical Investigation, Proposed Outdoor Boat Wash and Building Renovations, Mother’s Beach Non-Motorized Boat Facility Project, 14010 Palawan Way, Marina del Rey, California,” GPI Project No. 3080.23I, dated October 17, 2022.

Geotechnical Professionals Inc., “Geotechnical Investigation, Proposed Picnic Pavilion and Promenade Improvements, Marina Beach, Marina del Rey, California,” GPI Project No. 2380.23I, dated September 2, 2014.

APPENDIX C

ASBESTOS SURVEY REPORT

1520 W. Cameron Ave., Suite 103 ◆ West Covina, CA 91790
Ph. 626-962-4436 ◆ Fx. 626-962-4437 ◆ www.globalenvirotraining.com

Asbestos Survey Report

Job Site:

MPI BUILDING
14110 PALAWAN WAY
MARINA DEL REY, CA 90292

Prepared For:

MR. SALIM B. SIOUFI
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS (DPW)
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November 1, 2019

PROJECT №. **E219-337**

Mario Virgen
State of California
Certified Asbestos Consultant #00-2859

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SECTION 1

Introduction

GENERAL INFORMATION

Global Environmental Training and Consulting, Inc. (GETC) was retained by the Los Angeles County Department of Public Works to conduct an Asbestos Survey for suspect building materials for the MPI Building located at 14110 Palawan Way, located in Marina Del Rey, California.

The field inspection and sample collection were performed by GETC inspector Miguel Virgen, a California Certified Site Surveillance Technician #00-2760. The project manager for this project was Mario Virgen, a California Certified Asbestos Consultant #00-2859.

AUTHORIZATION

Authorization to perform this study was given by the Los Angeles County Department of Public Works representative Mr. Salim B. Sioufi.

This report has been prepared for the exclusive use of the Los Angeles County Department of Public Works.

PURPOSE

The purpose of this asbestos study was to identify any presence of Asbestos Containing Materials (ACM), within the MPI Building scheduled for renovation activities.

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GENERAL SUMMARY

Asbestos-containing building materials were found at MPI Building located at 14110 Palawan Way, located in Marina Del Rey, California. A material is considered by the State of California to be asbestos-containing if at least one sample collected from the area shows asbestos present in an amount greater than or equal to 0.1%. Specific removal requirements will apply if asbestos-containing materials will be disturbed during future renovation activities.

MPI BUILDING
14110 PALAWAN WAY
MARINA DEL REY, CA 90292

SUMMARY OF RESULTS

- **MPI BUILDING**
  - EXTERIOR ROOF –MASTICS (GREY/BLACK)
  - INTERIOR FLOORS UNDER CARPET – FELT (BLACK)

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SECTION 2

Warranty

Global Environmental Training and Consulting, Inc. (GETC) warrants that the findings contained herein have been prepared in general accordance with accepted professional practices as applied by similar professionals in the community at the time of its preparation. Changes in the state of the art or in applicable regulations cannot be anticipated and have not been addressed in this report.

The field and laboratory results reported herein are considered sufficient in detail and scope to determine the presence, condition and hazard potential of accessible and/or exposed suspect asbestos-containing building materials in the facility at the time of inspection. Test results are valid only for the material tested.

There is a distinct possibility that conditions may exist which could not be identified within the scope of study or which were not apparent during the site visit. This inspection covered only those areas, which were exposed and/or physically accessible to the inspector.

No other warranties are implied or expressed.

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Project №. **E219-337**

SECTION 3

Methodology (Asbestos)

GENERAL REFERENCES

Inspection procedures were performed in general accordance with the guidelines published by the EPA in 40 CFR Part 763 Subpart E, October 30, 1987. Sampling procedures included the collection of at least 3 samples of all suspect materials.

GENERAL ORGANIZATION

Before beginning the actual inspection, project coordination was conducted between Mr. Salim B. Sioufi representative of the Los Angeles County Department of Public Works and Mr. Mario Virgen representative of Global Environmental Training and Consulting, Inc. to discuss the inspection, including designating escorts, providing access, preferred inspection and sampling times, sampling procedures, and other issues.

Access to the property was provided by the Los Angeles County Department of Public Works personnel. The study consisted of three major activities: visual inspection, sampling, and lab analyses. Although these activities are listed separately, they are integrated tasks.

VISUAL INSPECTION

A California Certified Site Surveillance Technician performed the visual inspection. An initial building walkthrough was conducted to determine the presence and condition of suspect materials, which were accessible and/or exposed. Materials that were similar in general appearance were grouped into homogeneous sampling areas.

- Homogeneous Material Classifications

  A preliminary walkthrough of the buildings was conducted to determine areas of materials which were visually similar in color, texture, general appearance, and which appeared to have been installed at the same time. Such materials are termed "homogeneous materials" by the EPA. During this walkthrough, the approximate locations of these homogeneous materials were also noted.

  Following the EPA inspection protocol, each identified suspect homogeneous material was placed in one of the following EPA classifications:

  - **Surfacing Materials** (materials which have been spray or trowel applied to building members)
  - **Thermal System Insulation** (materials generally applied to various mechanical systems)
  - **Miscellaneous Materials** (any materials which do not fit either of the above categories)

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Project №. E219-337

SAMPLING PROCEDURES

Following the walkthrough, the inspector collected selected samples of exposed and/or accessible building materials suspected of containing asbestos.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material.

Samples of surfacing and miscellaneous materials were taken randomly when possible while attempting to sample already damaged areas so as to minimize disturbance of the material.

LABORATORY PROCEDURES

Method of Analysis

All bulk samples were analyzed by Polarized Light Microscopy (PLM) with dispersion staining as described by the E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). This is a standard method of analysis in optical mineralogy and the currently accepted method for the determination of asbestos in bulk samples. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The characteristic color displays which result enable mineral identification.

Laboratory Quality Control Program

Micron Environmental Labs, Inc. maintains an in-house quality control program. This program involves blind reanalysis of ten percent of all samples, precision and accuracy controls, and use of standard bulk reference materials.

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Project №. **E219-337**

SECTION 4

Results (Asbestos)

GENERAL SUMMARY

A material is considered to be asbestos-containing if at least one sample collected from the area shows asbestos present in an amount greater than one percent (1.0%). However, in California a material is considered by CAL OSHA to be an asbestos containing construction material (ACCM) if at least one sample collected from the area shows asbestos present is greater than one-tenth of one percent (0.1%).

REPORT FORMAT FOR SURVEY SUMMARY

Results of the survey are summarized in Table 1 – for the referenced property of section 6, entitled *Tables & Drawings*. Laboratory Analytical Results are in Section 7, entitled *Appendices*.

The following explains the content of each data column in Table 1 and its relationship with other items in the table.

Sample Group Number - The sample group number is assigned to a single sample or a cluster of samples that were taken from a single homogeneous material. This number is separate from the individual sample number assigned to each sample; e.g., if three samples are taken from a surfacing material, those three samples each have a separate individual sample number, but the group is assigned a single group identification number.

Material - Description of the homogeneous material.

Material Location - A description of a specific material location within the homogeneous area under which it is listed.

F/NF - F = friable, NF = nonfriable

Material Condition - Rated as: good = no damage or minimal damage; damaged = less than 25 % localized or 10 % distributed damage; or significantly damaged = greater than 25 % localized or 10% distributed damage.

Results of PLM Analysis: - The highest total percent asbestos found in the samples taken from a homogeneous material. If a "ND" is present in this column, no asbestos was detected in the group of samples. If a "TR" is entered, this indicates that a trace (<1%) of asbestos was found in the samples from a homogeneous material. The type of asbestos (e.g. chrysotile, amosite, etc.) present is shown in this column as well.

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SECTION 5

Discussion & Recommendations

ASBESTOS – DISCUSSION

On October 22, 2019, a survey to identify asbestos-containing materials was conducted at the referenced property located in Marina Del Rey, California. 8 homogeneous materials were identified and sampled. 2 of these homogeneous materials tested positive for asbestos. Please refer to Table 1 - Summary of Bulk Sample Analyses for Asbestos Identification located in Section 6 of this report.

Specific removal requirements apply if the asbestos-containing materials will be disturbed during maintenance, renovation or demolition activities.

ASBESTOS – RECOMMENDATIONS

Global Environmental Training & Consulting, Inc. recommends that a licensed Asbestos Abatement Contractor to be hired to remove all asbestos containing materials prior to any renovation or demolition activities. Also a certified Asbestos Consultant needs to be hired to insure proper Federal, State and Local procedures are followed and also to issue a Clearance Certification.

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SECTION 6

Tables & Drawings

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TABLE 1
ASBESTOS IDENTIFICATION TABLE

SAMPLE №.	ROOM	LOCATION	DESCRIPTION	RESULTS		
01-01	EXTERIOR	ROOF	ROLLED ON MEMBRANE (GREY/BLACK)	ND		
01-02	EXTERIOR	ROOF	ROLLED ON MEMBRANE (GREY/BLACK)	ND		
01-03	EXTERIOR	ROOF	ROLLED ON MEMBRANE (GREY/BLACK)	ND		
02-01	EXTERIOR	ROOF	MASTICS (GREY/BLACK)	ND		
02-02	**EXTERIOR**	**ROOF**	**MASTICS (GREY/BLACK)**	**4% CHRYSOTILE**		
02-03	EXTERIOR	ROOF	MASTICS (GREY/BLACK)	NA		
03-01	INTERIOR	WALLS	PLASTER (YELLOW/GREY)	NA		
03-02	INTERIOR	WALLS	PLASTER (YELLOW/GREY)	NA		
03-03	INTERIOR	WALLS	PLASTER (YELLOW/GREY)	NA		
04-01	INTERIOR	WALLS	DRYWALL (PINK)	NA		
04-02	INTERIOR	WALLS	DRYWALL (PINK)	NA		
04-03	INTERIOR	WALLS	DRYWALL (PINK)	NA		
05-01	INTERIOR	WALLS	JOINT COMPOUND (OFF WHITE)	NA		
05-02	INTERIOR	WALLS	JOINT COMPOUND (OFF WHITE)	NA		
05-03	INTERIOR	WALLS	JOINT COMPOUND (OFF WHITE)	NA		
06-01	INTERIOR	WALLS	COVEBASE 6" (BEIGE) & MASTIC (BEIGE)	COVEBASE	MASTIC	
				ND	ND	
06-02	INTERIOR	WALLS	COVEBASE 6" (BEIGE) & MASTIC (BEIGE)	ND	ND	
06-03	INTERIOR	WALLS	COVEBASE 6" (BEIGE) & MASTIC (BEIGE)	ND	ND	
07-01	INTERIOR	WALLS	COVEBASE 4" (BEIGE) & MASTIC (BEIGE)	COVEBASE	MASTIC	
				ND	ND	
07-02	INTERIOR	WALLS	COVEBASE 4" (BEIGE) & MASTIC (BEIGE)	ND	ND	
07-03	INTERIOR	WALLS	COVEBASE 4" (BEIGE) & MASTIC (BEIGE)	ND	ND	
08-01	**INTERIOR**	**FLOORS**	FLOORING (GREY), MASTIC (OFF WHITE), & **FELT (BLACK)**	FLOORING	MASTIC	**FELT**
				ND	ND	**8% CHRYSOTILE**
08-02	INTERIOR	FLOORS	FLOORING (GREY), MASTIC (OFF WHITE), & FELT (BLACK)	ND	ND	NA
08-03	INTERIOR	FLOORS	FLOORING (GREY), MASTIC (OFF WHITE), & FELT (BLACK)	ND	ND	NA

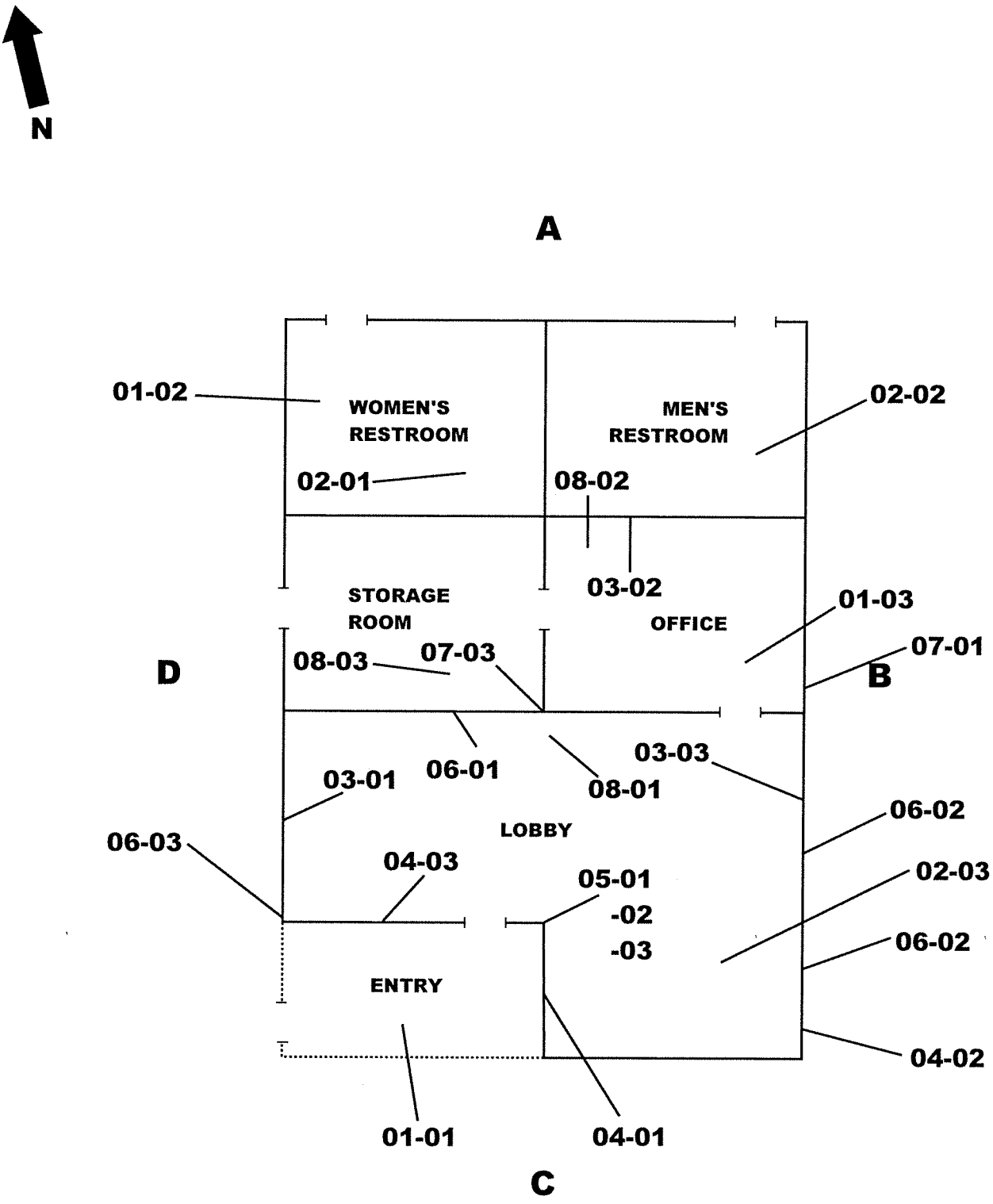
NOTES: **ND = NONE DETECTED**
NA = NOT ANALYZED

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DRAWING 1

SCHEMATIC

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PROPERTY NAME: MARINA DEL REY MPI BUILDING RENOVATIONS

PROJECT NUMBER: E219-337

SECTION 7

Appendices

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BULK
SAMPLING LOG

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Global Environmental Training & Consulting, Inc.

ASBESTOS SAMPLING LOG

Client:	DPW – SALIM B. SIOUFI	GETC's Job №:	E219-337
Site/Project:	MDR MPI BUILDING RENOVATION	GETC Inspector:	M. VIRGEN
Site Address 1:	14110 PALAWAN WAY	Date:	10/22/19
Site Address 2:	MARINA DEL REY, CA 91803	Page №:	1 OF 2

SAMPLE#	ROOM#	LOCATION	DESCRIPTION	Type	(F/NF)	Condition	Quantity	Asbestos Type %
01-01	EXT.	ROOF	ROLLED-ON MEMBRANE	M	NF	P		
-02	↓	↓	↓	↓	↓	↓		
-03	↓	↓	↓	↓	↓	↓		
02-01	EXT.	ROOF	MASTICS	S	NF	P	20 ϕ	
-02	↓	↓	↓	↓	↓	↓	↓	
-03	↓	↓	↓	↓	↓	↓	↓	
03-01	INT.	WALLS	PLASTER	S	NF	P		
-02	↓	↓	↓	↓	↓	↓		
-03	↓	↓	↓	↓	↓	↓		
04-01	INT.	WALLS	DRYWALL	M	NF	P		
-02	↓	↓	↓	↓	↓	↑		
-03	↓	↓	↓	↓	↓	↓		

20-2670	
CAC / CSST No.	

Inspector's Signature

TYPES OF MATERIALS:	↑S = Surfacing Material ↑TSI = Thermal System Insulation ↑M = Miscellaneous Material
CONDITION:	↑G = Good ↑F = Fair ↑P = Poor Condition
QUANTITY LIST:	↑S.F. = Square Footage ↑L.F. = Linear Footage ↑C.S. = Cubic Feet

1520 W. CAMERON AVE., SUITE 103 ◆ WEST COVINA, CA 91790 ◆ OFFICE: 626.962.4436 ◆ FAX: 626.962.4437
www.globalenvirotraining.com

Global Environmental Training & Consulting, Inc.

ASBESTOS SAMPLING LOG

Client:	DPW – SALIM B. SIOUFI	GETC's Job №:	E219-337
Site/Project:	MDR MPI BUILDING RENOVATION	GETC Inspector:	M. VARGAS
Site Address 1:	14110 PALAWAN WAY	Date:	10/22/19
Site Address 2:	MARINA DEL REY, CA 91803	Page №:	2 OF 2

SAMPLE#	ROOM#	LOCATION	DESCRIPTION	Type	(F/NF)	Condition	Quantity	Asbestos Type/%
05-01	INT.	WALLS	JOINT COMPOUND.	S	NF	P		
-02	↓	↓	↓	↓	↓	↓		
-03	↓	↓	↓	↓	↓	↓		
06-01	↓	WALLS	COVEBASE & MASTIC – 6"	M	NF	P		
-02	↓	↓	↓	↓	↓	↓		
-03	↓	↓	↓	↓	↓	↓		
07-01	↓	WALLS	COVEBASE & MASTIC – 4"	M	NF	P		
-02	↓	↓	↓	↓	↓	↓		
-03	↓	↓	↓	↓	↓	↓		
08-01	↓	FLOORS	FLOORING & MASTIC UNDER CARPET	M	NF	P	700 ф	
-02	↓	↓	↓	↓	↓	↓	↓	
-03	↓	↓	↓	↓	↓	↓	↓	

00 - 2760
CAC / CSST No.

Inspector's Signature

TYPES OF MATERIALS:	↑S = Surfacing Material ↑TSI = Thermal System Insulation ↑M = Miscellaneous Material
CONDITION:	↑G = Good ↑F = Fair ↑P = Poor Condition
QUANTITY LIST:	↑S.F. = Square Footage ↑L.F. = Linear Footage ↑C.S. = Cubic Feet

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LABORATORY RESULTS DOCUMENTATION & CHAIN OF CUSTODY

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Micron Environmental Labs, Inc.

3565 Lexington Ave • El Monte, California 91731 Phone (626) 454-4782 • Fax (626) 602-9661

October 29, 2019

Mario Virgen
Global Environmental T & C, Inc.
1520 W. Cameron Av. #103
West Covina, CA 91790

Subject: PLM Analysis of Bulk Samples
Micron Job No.: 13019235
Client Ref.: E219-337|DPW-Salim B. Sioufi
MDR MPI Building Renovation

Dear Mr. Virgen:

This report includes an attached summary of the samples collected for the analyses of the 33 bulk samples received by this laboratory on 10/22/2019. The analyses were completed using polarized light microscopy (PLM) in accordance with the EPA Method 600/R-93/116, July 1993. The quantification is based on the percentage of visual area estimation and is expressed as percent area. Samples that are multilayer are analyzed by layer unless, it has been requested as a composite analysis. These visual area estimate results are based on using reference standards materials that are routinely used in the laboratory.

For all the organic matrix samples that were not asbestos detected by (PLM), Micron Environmental recommends the use of Transmission Electron Microscopy (TEM) due to the size and the masking of the fibers.

Micron Environmental Labs, Inc. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200294-0 for asbestos fiber analysis (PLM).

Micron Environmental Labs, Inc. is responsible for the accuracy in this report, but we are not liable for any wrong data given to us by the customer regarding these samples or for any misuse or interpretation of information supplied by us. Liability shall extend to providing replicate analyses only. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government. We will retain these samples for a period of thirty days unless otherwise specified. This report pertains only to the samples submitted and analyzed.

Micron Environmental will not grant reproduction of this report unless an approval is obtained from this laboratory. Please feel free to contact the laboratory for questions regarding results or the analytical methods used at (626)-454-4782.

Sincerely,
Micron Environmental Labs, Inc.

Daniel Gamez
Director
Attachments
KU

Micron Environmental Labs, Inc.
3565 Lexington Ave.
El Monte, CA 91731
TEL: 626-454-4782
FAX: 626-602-9661

Analytical Method: EPA 600/R-93/116
NIST / NVLAP Lab Code No. 200294-0
California ELAP Certificate No. 2297

Micron Ref. No.
13019235

Sample Summary Results

Customer Project: *E219-337|DPW-Salim B. Sioufi* Microscopist: *David Espique*
MDR MPI Building Renovation

October 29, 2019

Mario Virgen
Global Environmental T & C, Inc.
1520 W. Cameron Av. #103
West Covina, CA 91790

Date Collected: *10/22/2019*
Date Received: *10/22/2019*
Date Analyzed: *10/24/2019*
No. Samples: *33*

Cust ID No. / Micron ID No.	Sample Description / Color	Asbestos Detected	Analytical Results	Q.C.
01-01 853234	Rolled-on Membrane Ext. Roof grey/black	No	10% Cellulose 5% Fibrous Glass 20% Mineral Filler 65% Organic Binders	X
01-02 853235	Rolled-on Membrane Ext. Roof grey/black	No	10% Cellulose 5% Fibrous Glass 20% Mineral Filler 65% Organic Binders	X
01-03 853236	Rolled-on Membrane Ext. Roof grey/black	No	10% Cellulose 5% Fibrous Glass 20% Mineral Filler 65% Organic Binders	
02-01 853237	Mastics Ext. Roof grey/black	No	8% Cellulose 92% Organic Binders	
02-02 853238 Positive Stop	Mastics Ext. Roof grey/black	Yes	4% Chrysotile 96% Organic Binders	
03-01 853239	Plaster Int. Walls yellow/grey	No	100% Mineral Filler	

Sample Summary Results

Date: *Oct 29, 2019*

Microscopist: *David Espique*

Micron Ref. No.: *13019235*

Cust ID No. / Micron ID No.	Sample Description / Color	Asbestos Detected	Analytical Results	Q.C.
03-02 853240	Plaster Int. Walls yellow/grey	No	100% Mineral Filler	
03-03 853241	Plaster Int. Walls yellow/grey	No	100% Mineral Filler	
04-01 853242	Drywall Int. Walls pink	No	2% Cellulose 1% Fibrous Glass 97% Mineral Filler	
04-02 853243	Drywall Int. Walls pink	No	2% Cellulose 1% Fibrous Glass 97% Mineral Filler	
04-03 853244	Drywall Int. Walls pink	No	2% Cellulose 1% Fibrous Glass 97% Mineral Filler	
05-01 853245	Joint Compound Int. Walls offwhite	No	100% Mineral Filler	
05-02 853246	Joint Compound Int. Walls offwhite	No	100% Mineral Filler	
05-03 853247	Joint Compound Int. Walls offwhite	No	100% Mineral Filler	

Sample Summary Results

Date: *Oct 29, 2019* Microscopist: *David Espique*

Micron Ref. No.: *13019235*

Cust ID No. / Micron ID No.	Sample Description / Color	Asbestos Detected	Analytical Results	Q.C.
06-01 853248	Cove Base 6" Int. Walls beige	No	100% Organic Binders	
06-01 853249	Mastic Int. Walls beige	No	100% Organic Binders	
06-02 853250	Cove Base 6" Int. Walls beige	No	100% Organic Binders	
06-02 853251	Mastic Int. Walls beige	No	100% Organic Binders	
06-03 853252	Cove Base 6" Int. Walls beige	No	100% Organic Binders	
06-03 853253	Mastic Int. Walls beige	No	100% Organic Binders	
07-01 853254	Cove Base 4" Int. Walls beige	No	100% Organic Binders	X
07-01 853255	Mastic Int. Walls beige	No	100% Organic Binders	

Sample Summary Results

Date: *Oct 29, 2019*

Microscopist: *David Espique*

Micron Ref. No.: *13019235*

Cust ID No. / Micron ID No.	Sample Description / Color	Asbestos Detected	Analytical Results	Q.C.
07-02 853256	Cove Base 4" Int. Walls beige	No	100% Organic Binders	
07-02 853257	Mastic Int. Walls beige	No	100% Organic Binders	
07-03 853258	Cove Base 4" Int. Walls beige	No	100% Organic Binders	
07-03 853259	Mastic Int. Walls beige	No	100% Organic Binders	
08-01 853260	Flooring Int. Floors Under Carpet grey	No	20% Cellulose 50% Mineral Filler 30% Organic Binders	X
08-01 853261	Mastic Int. Floors Under Carpet offwhite	No	100% Organic Binders	
08-01 853262 Positive Stop	Felt Int. Floors Under Carpet black	Yes	8% Chrysotile 8% Cellulose 84% Organic Binders	
08-02 853263	Flooring Int. Floors Under Carpet grey	No	20% Cellulose 50% Mineral Filler 30% Organic Binders	

Sample Summary Results

Date: *Oct 29, 2019*

Microscopist: *David Espique*

Micron Ref. No.: *13019235*

Cust ID No. / Micron ID No.	Sample Description / Color	Asbestos Detected	Analytical Results	Q.C.
08-02 853264	Mastic Int. Floors Under Carpet offwhite	No	100% Organic Binders	
08-03 853265	Flooring Int. Floors Under Carpet grey	No	20% Cellulose 50% Mineral Filler 30% Organic Binders	
08-03 853266	Mastic Int. Floors Under Carpet offwhite	No	100% Organic Binders	

Microscopist: David Espique

The limit of detection for this analytical method is less than one percent asbestos (visual area estimates). CV=0.04

Tuesday 10/29

Micron Reference No.: 13019235

Micron Environmental Labs

3565 Lexington Ave El Monte, California 91731 (626) 454-4782 (626) 454-4849 Fax

Request for Laboratory Services

Send Report To: ROBIN ROACH
Company: GLOBAL ENVIRONMENTAL
Address: 1520 W. CAMERON AVE. #103
WEST COVINA, CA 91790
Phone: (626) 962-4436 Fax: (626) 962-4437

Project No.: E219-337
Project Ref:: MDR MPI BUILDING RENOVATION
Results Reporting : Fax : (____) _____
Verbal: (____) _____
Email: Staff@globalenvirotraining.com

Turnaround and Instructions

Number of Samples 24 (33)

Turnaround Time Requested ☒ Normal (3-5 Days) ☐ 24/48 Hrs ☐ 4-8 Hrs ☐ (1-4) Hrs-Rush

Special Instructions ☐ Analyze Blanks ☐ Analyze All Samples ☒ Stop at 1st Positive

Service Requested: Each type of analysis requires as separate request.

Asbestos Sample Analysis

- ☒ Bulk Sample Analysis by PLM
- ☐ Bulk Sample Analysis by Point Count
  - ☐ 400 points
  - ☐ 1000 points
- ☐ Air Sample Analysis by PCM

Lead Sample Analysis by Atomic Absorption Spectroscopy

- ☐ Air Sample Analysis
- ☐ Paint Chip Sample Analysis
- ☐ Wipe Sample Analysis
- ☐ Soil Sample Analysis
- ☐ TTLC Sample Analysis
- ☐ STLC Sample Analysis
- ☐ TCLP Sample Analysis

Mold/Bacteria Sample Analysis

☐ Air -O-Cell Quantitative Analysis ☐ Tapelift Qualitative Analysis ☐ Sewage Screen

Other Analysis _____

For Lab Use Only

Acceptance/Rejection Criteria [ ] Complies [ ] Doesn't Comply

Lab Sample ID No.s: 853234-260e

Results Reported:

Date ____/____/____ Time _____ verbal fax email
Date ____/____/____ Time _____ verbal fax email
Date ____/____/____ Time _____ verbal fax email

Price per Sample $ _____
Invoice No.: _____
Date Completed: ____/____/____

Chain of Custody Delivered by ____Courier ____In Person ____US Mail ____Other

Relinquished By (Signature)	Received By (Signature)	Time	Date	Reason for Change of Custody
		1:05	10/22/19	

INSPECTOR'S CERTIFICATION

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State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant

Mario A Virgen
Name



Certification No. 00-2859

Expires on 01/05/20

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

State of California
Division of Occupational Safety and Health
Certified Site Surveillance Technician

Miguel A Virgen
Name



Certification No. 00-2760

Expires on 06/02/20

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

APPENDIX D

LEAD BASED PAINT SURVEY REPORT

1520 W. Cameron Ave., Suite 103 ◆ West Covina, CA 91790
Ph. 626-962-4436 ◆ Fx. 626-962-4437 ◆ www.globalenvirotraining.com

Lead / XRF Inspection Report

Job Site:

MPI BUILDING
14110 PALAWAN WAY
MARINA DEL REY, CA 90292

Prepared For:

MR. SALIM B. SIOUFI
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS (DPW)
900 SOUTH FREMONT AVENUE., 5TH FLOOR
ALHAMBRA, CALIFORNIA 91803
ssioufi@dpw.lacounty.gov

October 23, 2019

PROJECT №.: **E219-337**

Miguel Virgen
State of California Certified
Lead Inspector/Risk Assessor #11201

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2.0	SCOPE OF WORK
3.0	PROPERTY DESCRIPTION
4.0	QUALIFICATIONS
5.0	METHOD OF TESTING
6.0	TESTING PROTOCOL
7.0	SITE SPECIFIC OBSERVATIONS
8.0	SUMMARY OF RESULTS – INSPECTION
9.0	INSPECTION LIMITATIONS
10.0	RECOMMENDATIONS

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APPENDIX- **B**	INSPECTOR'S CERTIFICATION
APPENDIX- **C**	CDPH -8552 – LEAD EVALUATION
APPENDIX- **D**	SCHEMATIC

LEAD-BASED PAINT INSPECTION REPORT

1.0 INTRODUCTION

This report presents the results of Global Environmental Training & Consulting, Inc. lead-based paint inspection of the MPI Building located at 14110 Palawan Way, located in Marina Del Rey, California. The inspection was performed on October 22, 2019 in accordance with the U.S. Environmental Protection Agency (EPA) Title 17, CCR and the U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing as published in the 2nd Edition July 2012 for lead-based paint inspections and risk assessment. This document is prepared for the sole use of the property owner. No other party should rely on the information contained herein without prior written consent of the owner. The scope of services, inspection and assessment methodology, and results are presented below.

2.0 SCOPE OF WORK

The intent of this inspection was to ascertain the presence of lead-based paint above specified regulatory action levels. If lead-based paint were found, the inspection would identify types of architectural components and their respective lead concentrations (as it relates to the "action level" for lead) in such a manner that this report could be used as a basis for subsequent evaluations.

3.0 PROPERTY DESCRIPTION

The property is comprised of a Multi-use county building.

4.0 QUALIFICATIONS

Miguel Virgen of Global Environmental Training & Consulting, Inc. performed the inspection at the above-mentioned property using a NITON XLP portable XRF analyzer instrument. Miguel Virgen has attended the manufacturer's radiation safety course for operation and handling of the instrument, and completed an EPA sponsored curriculum in Lead Inspector and Risk Assessment Training. Miguel Virgen is currently certified by the California Department of Public Health Services, September 29, 2020.

5.0 METHOD OF TESTING

The method employed for testing painted surfaces was with an X-ray fluorescence (XRF) analyzer. The XRF is a NITON XLP 300, serial number 80833. The instrument was calibrated to the specifications of the performance characteristics sheets for the NITON XLP 300 verified against the National Institute of Standards and Testing (NIST) Standard Reference Material (SRM) 2579 lead film (1.04 mg/cm^2).

6.0 TESTING PROTOCOL

Testing for the paint inspections was conducted in accordance with Chapter 7 of the Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing as published by HUD in the 2nd Edition July 2012. Interior & Exterior XRF readings were taken on representative painted surfaces on each building component in each room equivalent. The HUD definition of lead-based paint is lead equal to or greater than 1.0 mg/cm^2. All XRF readings below the regulatory definition are considered negative and all readings at and above this level are considered positive. The Los Angeles County "Action Level" for Lead-Based Paint is equal to or greater than 0.7 mg/cm^2.

7.0 SITE SPECIFIC OBSERVATIONS

The property has not been modified from its original construction. At the time of the inspection, the condition of the interior & exterior paint was in cracked condition on all components sampled. Please see detailed listing of the conditions of each component on Appendix B "XRF Results."

8.0 SUMMARY OF RESULTS - INSPECTION

The following types of components indicated the presence of lead at or above the Los Angeles County action level. These components include:

MPI BUILDING
14110 PALAWAN WAY
MARINA DEL REY, CA 90292

LIST OF POSITIVE RESULTS:

- **NONE FOUND**

A summary of the results for Interior & Exterior testing at the various site locations have been provided in Appendix B of this report.

The inspection and assessment were planned, developed, and implemented based on the experience in performing lead-based paint inspections by Global Environmental Training & Consulting, Inc. The inspection and assessment were conducted in accordance with the HUD Guidelines as published in the 2nd Edition July 2012. Global Environmental Training & Consulting, Inc. utilized state-of-the-art practices and techniques in accordance with regulatory standards while performing the inspection and assessment. A copy of personnel certifications and equipment licenses has been provided for your review. GETC's evaluation of the painted surfaces identified during the inspection and risk assessment was based on conditions observed at the time of the inspection. Global Environmental Training & Consulting, Inc. cannot be responsible for changing conditions that may alter the relative exposure risk for future changes in accepted methodology.

9.0 INSPECTION LIMITATIONS

The conclusion presented herein are based on the agreed upon scope of work. The services performed on the subject property included nondestructive sampling.

It should be understood this report might not be a definitive of the presence of lead, due to the nature of manufacturing, application, and location of lead-containing materials. Global Environmental Training & Consulting, Inc. makes no warranties of Guarantees as to the accuracy or completeness of information obtained. It is possible that information exists beyond the scope of this investigation.

The services provided by the inspector have been conducted in a manner consistent with care ordinary exercised by members of the lead inspection profession currently practicing under similar conditions. No other warranty, expressed or implied, is made.

10.0 RECOMMENDATIONS

Lead-based paint is a common cause of lead poisoning in children and represents a threat to the health and welfare of the occupants. Where economically feasible, it is our recommendation that all components that tested positive, and any similar untested components, be considered lead-laden and lead-safe procedures is incorporated into any overall renovation and maintenance strategy. Safe methods include: containing any work area to prevent dispersal of lead dust and chips, wet sanding and scraping at a minimum; collecting all paint chips and debris and, properly disposing of them.

APPENDIX

A

XRF RESULTS

Reading	Site	Type	Room	Component	Side	Substrate	Condition	Color	Results	PbC
1	SHUTTER_CAL									1.15
2		**PAINT**		**CALIBRATE**					**Positive**	**1**
3		**PAINT**		**CALIBRATE**					**Positive**	**0.7**
4		PAINT		CALIBRATE					Negative	0.4
5	MDR MPI BLDG	PAINT	LOBBY	WALL	A	PLASTER	CRACKED	WHITE	Negative	0.02
6	MDR MPI BLDG	PAINT	LOBBY	WALL	B	PLASTER	CRACKED	WHITE	Negative	0.02
7	MDR MPI BLDG	PAINT	LOBBY	WALL	C	DRYWALL	CRACKED	WHITE	Negative	0.06
8	MDR MPI BLDG	PAINT	LOBBY	WALL	D	PLASTER	CRACKED	WHITE	Negative	0.02
9	MDR MPI BLDG	PAINT	LOBBY	DOOR	C	WOOD	CRACKED	GREY	Negative	0
10	MDR MPI BLDG	PAINT	LOBBY	DOOR FRAME	C	WOOD	CRACKED	GREY	Negative	0
11	MDR MPI BLDG	PAINT	LOBBY	WINDOW GATD	D	METAL	CRACKED	GREY	Negative	0
12	MDR MPI BLDG	PAINT	LOBBY	CEILING	UPPER	WOOD	CRACKED	WHITE	Negative	0.01
13	MDR MPI BLDG	PAINT	LOBBY	DOOR GATE	A	METAL	CRACKED	GREY	Negative	0
14	MDR MPI BLDG	PAINT	OFFICE	WALL	A	PLASTER	CRACKED	WHITE	Negative	0.04
15	MDR MPI BLDG	PAINT	OFFICE	WALL	B	PLASTER	CRACKED	WHITE	Negative	0.08
16	MDR MPI BLDG	PAINT	OFFICE	WALL	C	DRYWALL	CRACKED	WHITE	Negative	0.07
17	MDR MPI BLDG	PAINT	OFFICE	WALL	D	DRYWALL	CRACKED	WHITE	Negative	0
18	MDR MPI BLDG	PAINT	OFFICE	DOOR	C	WOOD	CRACKED	WHITE	Negative	0.01
19	MDR MPI BLDG	PAINT	OFFICE	DOOR FRAME	C	WOOD	CRACKED	WHITE	Negative	0
20	MDR MPI BLDG	PAINT	STORAGE	WALL	A	PLASTER	CRACKED	WHITE	Negative	0.03
21	MDR MPI BLDG	PAINT	STORAGE	WALL	B	DRYWALL	CRACKED	WHITE	Negative	0
22	MDR MPI BLDG	PAINT	STORAGE	WALL	C	PLASTER	CRACKED	WHITE	Negative	0
23	MDR MPI BLDG	PAINT	STORAGE	WALL	D	PLASTER	CRACKED	WHITE	Negative	0.09
24	MDR MPI BLDG	PAINT	STORAGE	DOOR	D	WOOD	CRACKED	WHITE	Negative	0
25	MDR MPI BLDG	PAINT	STORAGE	DOOR FRAME	D	WOOD	CRACKED	WHITE	Negative	0.02
26	MDR MPI BLDG	PAINT	MENS RR	WALL	A	PLASTER	CRACKED	WHITE	Negative	0
27	MDR MPI BLDG	PAINT	MENS RR	WALL	B	PLASTER	CRACKED	WHITE	Negative	0
28	MDR MPI BLDG	PAINT	MENS RR	WALL	C	PLASTER	CRACKED	WHITE	Negative	0
29	MDR MPI BLDG	PAINT	MENS RR	WALL	D	PLASTER	CRACKED	WHITE	Negative	0
30	MDR MPI BLDG	PAINT	MENS RR	CEILING	UPPER	WOOD	CRACKED	WHITE	Negative	0
31	MDR MPI BLDG	PAINT	MENS RR	DOOR	A	WOOD	CRACKED	WHITE	Negative	0
32	MDR MPI BLDG	PAINT	MENS RR	DOOR FRAME	A	WOOD	CRACKED	WHITE	Negative	0.01
33	MDR MPI BLDG	PAINT	MENS RR	LEUVERS	A	WOOD	CRACKED	GREY	Negative	0

Reading	Site	Type	Room	Component	Side	Substrate	Condition	Color	Results	PbC
34	MDR MPI BLDG	PAINT	WOMENS RR	WALL	A	PLASTER	CRACKED	WHITE	Negative	0.03
35	MDR MPI BLDG	PAINT	WOMENS RR	WALL	B	PLASTER	CRACKED	WHITE	Negative	0.04
36	MDR MPI BLDG	PAINT	WOMENS RR	WALL	C	PLASTER	CRACKED	WHITE	Negative	0.11
37	MDR MPI BLDG	PAINT	WOMENS RR	WALL	D	PLASTER	CRACKED	WHITE	Negative	0.11
38	MDR MPI BLDG	PAINT	WOMENS RR	DOOR	A	WOOD	CRACKED	GREY	Negative	0
39	MDR MPI BLDG	PAINT	WOMENS RR	DOOR FRAME	A	WOOD	CRACKED	GREY	Negative	0.03
40	MDR MPI BLDG	PAINT	WOMENS RR	LEUVER	A	WOOD	CRACKED	GREY	Negative	0.01
41	MDR MPI BLDG	PAINT	EXTERIOR	WALL	A	WOOD	CRACKED	WHITE	Negative	0.12
42	MDR MPI BLDG	PAINT	EXTERIOR	WALL	B	WOOD	CRACKED	WHITE	Negative	0.19
43	MDR MPI BLDG	PAINT	EXTERIOR	WALL	C	WOOD	CRACKED	WHITE	Negative	0.2
44	MDR MPI BLDG	PAINT	EXTERIOR	WALL	D	WOOD	CRACKED	WHITE	Negative	0
45	MDR MPI BLDG	PAINT	EXTERIOR	STAIRS	D	WOOD	CRACKED	WHITE	Negative	0
46	MDR MPI BLDG	PAINT	EXTERIOR	FASCIA	D	WOOD	CRACKED	GREY	Negative	0.03
47	MDR MPI BLDG	PAINT	EXTERIOR	EAVES	D	WOOD	CRACKED	GREY	Negative	< LOD
48	MDR MPI BLDG	PAINT	EXTERIOR	RAFTER	D	WOOD	CRACKED	GREY	Negative	0.03
49	MDR MPI BLDG	PAINT	EXTERIOR	WINDOW WELL	D	WOOD	CRACKED	GREY	Negative	0.02

APPENDIX

B

INSPECTOR'S CERTIFICATIONS

California Department of PublicHealth

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
 **Miguel Virgen**	Lead Inspector/Assessor	LRC-00002616	9/29/2020
	Lead Project Monitor	LRC-00002615	9/29/2020

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD.

APPENDIX

C

CDPH 8552 – LEAD EVALUATION

State of California—Health and Human Services Agency

California Department of Public Health

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation 10/22/19

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk Assessment ☐ Clearance Inspection ☐ Other (specify) _____

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
14110 PALAWAN WAY	MARINA DEL REY	LOS ANGELES	90292

Construction date (year) of structure	Type of structure	Children living in structure?
1960's	☐ Multi-unit building ☐ School or daycare ☐ Single family dwelling ☑ Other OFFICE BUILDING	☐ Yes ☐ Don't Know ☑ No

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
SALIM SIOUFI	626-300-2361

Address [number, street, apartment (if applicable)]	City	State	Zip Code
900 S. FREMONT AVE., 5TH FLR	ALHAMBRA	CALIFORNIA	91803

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☑ No lead-based paint detected ☐ Intact lead-based paint detected ☐ Deteriorated lead-based paint detected

☐ No lead hazards detected ☐ Lead-contaminated dust found ☐ Lead-contaminated soil found ☐ Other _____

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
MIGUEL VIRGEN	626-962-4436 EXT.103

Address [number, street, apartment (if applicable)]	City	State	Zip Code
1520 W. CAMERON AVE. #103	WEST COVINA	CA	91790

CDPH certification number	Signature	Date
11201		10/23/19

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656

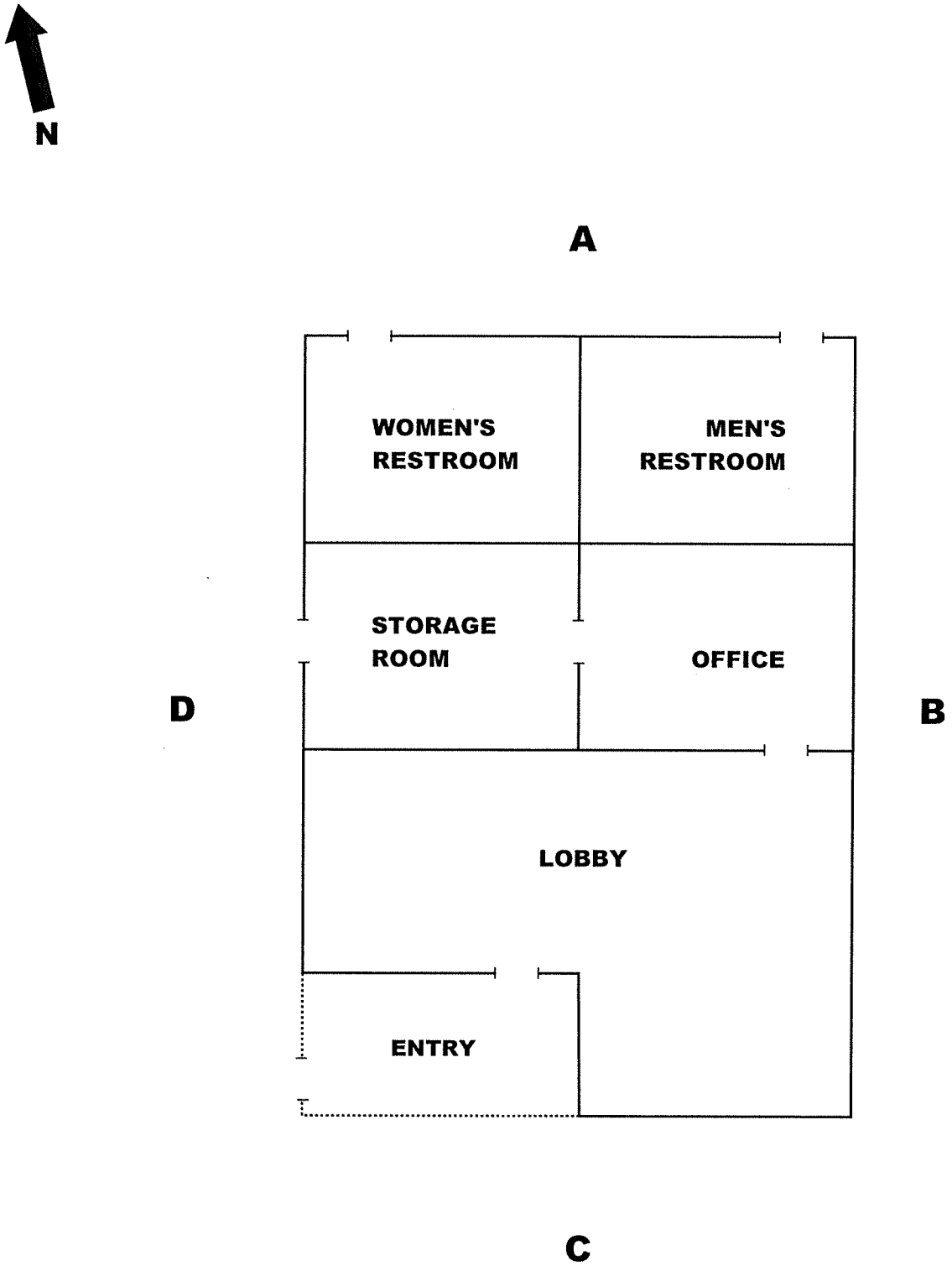
FAXED: 10/23/19
GETC#: E219-337
REF:MDR MPI BLDG RENOVATION

CDPH 8552 (6/07)

APPENDIX

D

SCHEMATIC



PROPERTY NAME: MARINA DEL REY MPI BUILDING RENOVATIONS
PROJECT NUMBER: E219-337

APPENDIX E

HAZARDOUS MATERIALS ABATEMENT WORK PLAN

ATTACHMENT A

PROJECT MANUAL

AT

MPI BUILDING

LOCATED AT

14110 PALAWAN WAY
MARINA DEL REY, CA 90292

PREPARED BY:

GLOBAL ENVIRONMENTAL TRAINING & CONSULTING, INC
1520 W. CAMERON AVE. SUITE 103
WEST COVINA

PREPARED FOR:

LOS ANGLES COUNTY DEPARTMENT OF PUBLIC WORKS
900 SOUTH FREEMENT AVE.
ALHAMBRA, CA 91803

NOVEMBER 4, 2019

MARIO A. VIRGEN, CAC #00-2859

I. MPI BUILDING

A. Asbestos Removal:

1. Remove and dispose of Black Felt under carpet, approximately 700 square feet located on the interior floors (See Asbestos Report dated November 1, 2019).

2. Remove and dispose of Roof Penetration Mastic, approximately 20square feet (See Asbestos Report dated November 1, 2019).

MPI BUILDING

I. GENERAL

A. The following special conditions shall take precedence over the standard specifications.

B. Abatement contractor shall be responsible for verifying all dimensions prior to bid. Any amounts listed on these specifications are only estimated and are not to be considered final measurements.

C. Abatement contractor shall provide a secured and separate storage for all materials, equipment, and waste.

D. Abatement contractor shall physically secure all work areas until final air or wipe clearance is achieved, as approved by the District representative.

E. In addition to the project specification submittal requirements, the Abatement contractor shall submit for review and approval an asbestos and lead abatement work plan. The asbestos and lead work plan shall detail the means and methods that will be used for controlling and containing fiber and particulate release during the removal of asbestos containing material and paint film stabilization in accordance with the project specifications. The plan shall include, but not be limited to, a drawing that adequately depicts the location of asbestos control areas, change areas, emergency exit routes and exits, and any special features.

F. The abatement contractor shall not proceed with the disturbance of ACM and Paint Film Stabilization until the asbestos and lead work plan and written work schedule have been approved by a District Representative.

G. Noise from the work process shall not interfere with the normal and scheduled day or evening school activities. Work schedule will be determined with the involvement of the school staff at the job start meeting.

H. At the commencement of the project, all Contract Documents, Project Manual and Specifications shall be on site and remain until the completion of the project.

II. SITE SPECIFIC CONDITIONS

A. Contractor shall follow all applicable Federal, State, County and Local regulations.

B. Contractor shall provide separate containers for waste and tool/materials. Placement of the waste and tools/materials storage container must be approved by the site administrator.

C. Load out and transportation of waste or materials shall not be performed when the public is present.

D. The abatement contractor shall demarcate the work area to warn unauthorized persons from entering the workspace.

III. CLOSE-OUT DOCUMENTS

A. The contractor shall provide the Districts Representative all of the following documents:

i. Foreman's daily job report
ii. Employee entry/exit logs for all work areas
iii. Visitor entry/exit logs for all work areas
iv. Air sample results for personnel
v. Copy of non-hazardous waste manifest

B. Abatement contractor shall have ten (10) working days after the completion of the abatement of the last work area to submit the close- out documents.

END OF SECTION