<u>PRO</u> .	JECT I	D NO.	ı	

SPECIAL PROVISIONS SECTION R - ROADWAY

The following Special Provisions supplement and amend the Standard Specifications for Public Works Construction, 2015 Edition. As a reference convenience, these Special Provisions have been arranged into a format which parallels the Standard Specifications.

Prepared by:	
Date	_
Reviewed:	
Date	_

SECTION R - ROADWAY

Table of Contents

Table of Contents	Dogo
PART 1 GENERAL PROVISIONS	Page
SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR	
7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS.	R-1
PART 2 CONSTRUCTION MATERIALS	
SECTION 200 - ROCK MATERIALS	
200-1 ROCK PRODUCTS	R-2
200-1.6 Stone for Riprap.	R-2
200-1.6.1 General	
200-1.6.2 Grading Requirements.	
200-3 IMPORTED FILL MATERIAL.	
200-3.1 General	
200-3.2 Sampling Frequency and Location	
200-3.3 Soil Sample Analysis	
200-3.4 Quality Control.	K-4
200-3.5 Reporting and Documentation	
200-3.6 Approval	
200-5.7 Fayinent	
SECTION 203 - BITUMINOUS MATERIALS	
203-5 SLURRY SEAL	R-5
203-5.4 Emulsion-Aggregate Slurry (EAS)	R-5
203-5.4.2 Materials	R-5
203-5.4.2.2 Emulsified Asphalt	R-5
203-6 ASPHALT CONCRETE	
203-6.1 General	
203-6.2 Materials	
203-6.2.1 Asphalt Binder.	R- <u>6</u>
203-6.7.2 Warm Mix Asphalt (WMA) Technologies	
203-11 ASPHALT RUBBER HOT MIX (ARHM) WET PROCESS	
203-11.2 Materials	
203-11.2.3 Crumb Rubber Modifier (CRM).	
203-11.2.5 Warm Mix Asphalt (WMA) Additives	
203-11.4 Mixing paving Asphalt and CRM.	
203-11.4.1 General.	
203-11.4.2 WMA Additives.	
203-11.4.3 Asphalt Rubber Binder with Aggregate.	
203-12 ASPHALT RUBBER AND AGGREGATE MEMBRANE (ARAM)	R-10
203-12.2 Materials	
203-12.2.4 Acceptance	
203-14 TIRE RUBBER MODIFIED ASPHALT CONCRETE (TRMAC)	
203-14.2 Materials	

203-14.2.4 Performance Graded Tire Rubber Modified Paving Asphalt	
SECTION 206 - MISCELLANEOUS METAL ITEMS	
206-6 CHAIN LINK FENCE206-6.1 General	
SECTION 211 - MATERIAL TESTS	
211-1 COMPACTION TESTS	R-13
211-1.1 Laboratory Maximum Density	
211-1.3 Relative Compaction.	
PART 3 - CONSTRUCTION METHODS	
SECTION 300 - EARTHWORK	
300-1 CLEARING AND GRUBBING.	R-14
300-1.3 Removal and Disposal of Materials	
300-1.3.2 Requirements.	
300-1.3.3 Construction and Demolition Debris Recycling	
300-1.3.3.1 General	
300-1.3.3.2 Definitions	
300-1.3.3.3 Recycling Summary	R-17
300-1.4 Payment	R-17
300-2 UNCLASSIFIED EXCAVATION.	
300-2.8 Measurement.	
300-2.9 Payment	
300-4 UNCLASSIFIED FILL.	
300-4.9 Measurement and Payment.	
300-5 BORROW EXCAVATION.	
300-5.3 Placing and Compacting.	
300-5.4 Measurement and Payment	K-19
300-11 General	
300-11.1 General 300-11.2 Placing Stone 300-11.2 Placing Stone 300-11.2 Placing Stone 300-11.2 Placing Stone 300-11.1 General	
300-11.3 Concreted Stone Slope Protection.	
300-11.3.1 Concrete	
300-11.4 Measurement and Payment.	
300-11.4.1 Measurement.	
300-11.4.2 Payment	
300-12 GEOTEXTILES FOR STABILIZATION.	
300-12.1 General	
300-12.2 Placement	
300-12.3 Measurement and Payment	R-21
300-13 ROOT PRUNING	
300-13.1 General	
300-13.2 Root Control Barrier.	
300-13.3 Crown Reduction	
300-13.4 Cleanup	
300-13.5 Payment	R-23

300-14 SHOULDER GRADING.	R-24
300-14.1 General	R-24
300-14.2 Measurement	R-24
300-14.3 Payment	R-24
SECTION 301 - TREATED SOIL, SUBGRADE PREPARATION, AND PLACEN	/IENT
OF BASE MATERIALS	
301-1 SUBGRADE PREPARATION	R-24
301-1.1 General	R-24
301-1.2 Preparation of Subgrade	R-24
301-1.3 Relative Compaction.	
301-1.6 Adjustment of Manhole Frame and Cover Sets to Grade	R-26
301-1.7 Payment	R-26
301-2 UNTREATED BASE	R-27
301-2.1 General	R-27
301-2.3 Compacting	R-27
301-2.4 Measurement and Payment	R-28
301-3 PORTLAND CEMENT TREATED MATERIALS	
301-3.4 Cement Stabilized Pulverized Base (CSPB)	R-29
301-3.4.2 Materials	
301-3.4.2.5 Prime/Tack Coat	
301-3.4.3 Mix Design	
301-3.4.5 Sequence of Work	
301-3.4.15 Fog Seal	
301-3.4.15 Maintenance and Prime/Tack Coat	
301-3.4.15.1 Maintenance	
301-3.4.15.2 Prime/Tack Coat	
301-3.4.16 Maintenance	
301-3.4.17 Payment	
301-6 LIME STABILIZED PULVERIZED BASE (LSPB)	
301-6.1 General	
301-6.2 Materials	
301-6.2.1 Lime.	
301-6.2.2 Water.	
301-6.2.3 Pulverized Base Material	
301-6.2.4 Mix Design.	
301-6.3 Equipment	
301-6.4 Sequence of Work	R-32
301-6.5 Pulverizing	
301-6.6 Initial Placement.	
301-6.7 Quicklime Spreading and Initial Mixing.	
301-6.8 Mellowing and Final Mixing.	
301-6.9 Compaction.	
301-6.10 Final Placement.	
301-6.11 Curing	
301-6.12 Maintenance and Prime/Tack Coat.	
301-6.12.1 Maintenance	
301-6.12.2 Prime/Tack Coat.	
301-6.13 Measurement.	
301-6.14 Payment	
JU 1-U. 1+ Гауппспп	17-30

301-7 PULVERIZED BASE MATERIAL (PBM)	R-37
301-7.1 General	
301-7.2 Requirements	
301-7.3 Spreading.	
301-7.4 Compaction.	
301-7.5 Measurement	
301-7.6 Payment	
301-7.0 Fayillelit	K-31
SECTION 302 - ROADWAY SURFACING	
302-1 COLD MILLING OF EXISTING PAVEMENT	D 20
302-1.1 General	
302-1.9 Traffic Signal Loop Detectors	
302-1.12 Payment	
302-4 SLURRY SEAL SURFACING.	
302-4.3 Continuous-Flow Mixers	
302-4.3.1 General	
302-4.3.4 Calibration	
302-4.3.4.1 General	
302-4.5 Scheduling, Public Convenience and Traffic Control	
302-4.6 Emulsion-Aggregate Slurry (EAS)	
302-4.6.4 Aggregate Application Rate	R-39
302-4.6.4.1 General	
302-4.8 Spreading and Application.	R-39
302-4.9 Field Sampling and Testing	R-39
302-4.9.1 Field Sampling	R-39
302-4.10 Measurement	R-40
302-4.10.1 General	R-40
302-4.10.2 Slurry Seal Mixed in Continuous-Flow Mixers	R-40
302-4.11 Payment	
302-4.11.2 Slurry Seal Mixed in Continuous-Flow Mixers.	
302-5 ASPHALT CONCRETE PAVEMENT.	
302-5.1 General	
302-5.5 Distribution and Spreading	
302-5.6 Rolling.	
302-5.6.2 Density and Smoothness.	
302-5.7 Joints.	
302-5.8 Manholes (and other structures).	
302-5.9 Measurement and Payment.	
302-5.10 Asphalt Concrete Curb.	
302-5.10 Asphalt Concrete Curb.	
302-5.10.1 General	
302-5.10.3 Measurement and Payment	
302-6 PORTLAND CEMENT CONCRETE PAVEMENT	
302-6.1 General	K-48
302-6.2 Forms and Headers.	
302-6.2.1 General	
302-6.2.3 Metal Forms.	
302-6.3 Placing Concrete	
302-6.3.1 General	
302-6.3.3 Roller Screed	R-50

302-6.4 Finishing	R-50
302-6.4.2 Tamping	R-50
302-6.4.4 Final Finishing	
302-6.4.5 Smoothness	
302-6.4.5.1 General	R-51
302-6.4.5.2 Profilograph Testing	R-51
302-6.4.5.3 Requirements	R-51
302-6.4.5.4 Grinding	R-53
302-6.4.5.5 Acceptance	R-53
302-6.5 Joints	
302-6.5.2 Construction Joints	R-53
302-6.5.4 Weakened-plane Joints	R-53
302-6.6 Curing	
302-6.8 Measurement and Payment	
302-9 ASPHALT RUBBER HOT MIX (ARHM).	
302-9.1 General.	
302-9.1.1 Quality Control Program	
302-9.1.2 Recycled Content Certification for the Waste Tire Grant Program	
302-9.3 Distribution and Spreading.	
302-9.3.1 Test Strip	
302-9.3.2 Suspension and Resumption of Distribution and Spreading	
302-9.4 Rolling	
302-9.5 Joints	R-62
302-9.6 Manholes (and other structures).	R-62
302-9.9 Payment	
302-10 ASPHALT RUBBER AND AGGREGATE MEMBRANE	
302-10.1 Application	
302-10.2 Screenings.	
302-10.5 Measurement and Payment	
302-12 TIRE RUBBER MODIFIED ASPHALT CONCRETE (TRMAC)	
302-12.1 General 302-12.1.1 Quality Control Program 302-12.1.1	
302-12.3 Distribution and Spreading.	
302-12.3.1 Test Strip	
302-12.3.2 Suspension and Resumption of Distribution and Spreading.	
302-12.4 Rolling.	
302-12.5 Joints	
302-12.6 Manholes (and Other Structures).	
302-12.8 Measurement.	
302-12.9 Payment.	
302 1210 1 aymona	
SECTION 303 - CONCRETE AND MASONRY CONSTRUCTION	
303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, AL	LLEY
INTERSECTIONS, ACCESS RAMPS, AND DRIVEWAYS	R-74
303-5.1 Requirements	
303-5.1.1 General	
303-5.1.4 Curb Ramps	R-75
303-5.3 Placing Concrete	
303-5.5 Finishing	
303-5.5.3 Walk	
303-5.5.5 Alley Intersections, Access Ramps, and Driveways	R-75

303-5.8 Backfilling and Clean-Up	R-/6
303-5.9 Measurement and Payment	R-76
303-6 STAMPED CONCRETE	R-76
303-6.3 Pattern	R-76
303-6.4 Curing	R-76
303-7 COLORED CONCRETE.	R-77
303-7.1 General	R-77
303-7.2 Method A (Dry Shake)	R-77
303-9 TREE WELLS AND TREE WELL COVERS	R-77
303-9.1 General	
303-9.2 Measurement and Payment	R-77
SECTION 304 - METAL FABRICATION AND CONSTRUCTION	N
304-2 METAL RAILINGS.	R-78
304-2.2 Not Used	R-78
304-2.2 Metal Beam Guard Railing.	
304-2.2.1 General	
304-2.2.2 Terminal System	R-79
304-2.2.2.1 General.	
304-2.2.2.2 Alternative In-Line Terminal System	R-79
304-2.2.2.3 Alternative Flared Terminal System	
304-2.2.2.4 Type CAT Terminal System.	
304-2.2.3 Measurement and Payment.	
PART 8 - LANDSCAPING AND IRRIGATION	
SECTION 801 - INSTALLATION	
	R-83
801-4 PLANTING	
801-4 PLANTING	R-83
801-4 PLANTING	R-83 R-83
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General.	R-83 R-83 R-83
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials.	R-83 R-83 R-83
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation.	R-83 R-83 R-83 R-83
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT.	R-83 R-83 R-83 R-83 R-84
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation.	R-83 R-83 R-83 R-83 R-84 R-85
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT.	R-83 R-83 R-83 R-84 R-85 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION.	R-83 R-83 R-83 R-84 R-85 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT.	R-83 R-83 R-83 R-84 R-85 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION.	R-83 R-83 R-83 R-84 R-85 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION AND PAVEMENT RECYCLING PROCESSES	R-83 R-83 R-83 R-83 R-84 R-85 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION AND PAVEMENT RECYCLING PROCESSES SECTION 900 - MICRO-MILLING	R-83 R-83 R-83 R-83 R-84 R-85 R-86 R-86
801-4 PLANTING	R-83R-83R-83R-83R-84R-85R-86R-86R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION AND PAVEMENT RECYCLING PROCESSES SECTION 900 - MICRO-MILLING 900-1 GENERAL. 900-2 MILLING MACHINES.	R-83 R-83 R-83 R-83 R-84 R-85 R-86 R-86 R-86 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION AND PAVEMENT RECYCLING PROCESSES SECTION 900 - MICRO-MILLING 900-1 GENERAL. 900-2 MILLING MACHINES. 900-3 MILLING OPERATIONS.	R-83 R-83 R-83 R-83 R-84 R-85 R-86 R-86 R-86 R-86 R-86 R-86
801-4 PLANTING. 801-4.9 Erosion Control Planting. 801-4.9.6 Erosion Protection Blanket. 801-4.9.6.1 General. 801-4.9.6.2 Materials. 801-4.9.6.3 Installation. 801-6 MAINTENANCE AND PLANT ESTABLISHMENT. 801-7 MEASUREMENT. 801-8 PAYMENT. PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION AND PAVEMENT RECYCLING PROCESSES SECTION 900 - MICRO-MILLING 900-1 GENERAL. 900-2 MILLING MACHINES. 900-3 MILLING OPERATIONS. 900-3 WORK SITE MAINTENANCE.	R-83R-83R-83R-84R-85R-86R-86R-86R-86R-86

SECTION 901 - PCC PAVEMENT GRINDING

901-1 GENERAL	R-88
901-2 EQUIPMENT	
901-3 GRINDING REQUIREMENTS.	R-88
901-4 RESIDUE MANAGEMENT PLAN (RMP)	R-89
901-5 RESIDUE COLLECTION.	
901-6 STORAGE	R-89
901-7 TRANSPORTATION AND DISPOSAL	R-90
901-8 MEASUREMENT	
901-9 PAYMENT	
SECTION 902 - MODIFIED PAVEMENTS	
902-4 TIRE RUBBER MODIFIED TACK COAT (TRMTC)	R-90
902-4.1 General	R-90
902-4.2 Materials	R-90
902-4.3 Application	R-91
902-4.4 Measurement.	R-91
902-4.5 Payment	R-91
902-6 POLYMER MODIFIED ASPHALT CONCRETE (PMAC) PAVEMENT	R-91
902-6.1 General	
902-6.2 Polymer Modified Asphalt Concrete	
902-6.2.1 General	
902-6.2.2 Mix Designs	
902-6.2.3 Polymer Modified Paving Asphalt	R-92
902-6.2.4 Aggregate	
902-6.2.5 Mineral Filler	
902-6.2.6 Mixtures	
902-6.2.7 Aggregate Storing, Drying and Screening	
902-6.2.8 Proportioning.	
902-6.2.9 Mixing	
902-6.2.10 Storage	
902-6.2.11 Miscellaneous Requirements.	
902-6.3 Tack Coat	
902-6.4 Distribution and Spreading	
902-6.4.1 General	
902-6.4.2 Quality Control Program	
902-6.4.3 Test Strip.	
902-6.4.4 Suspension and Resumption of Distribution and Spreading	
902-6.5 Rolling.	
902-6.6 Joints	
902-6.7 Manholes (and Other Structures).	
902-6.8 Measurement.	
902-6.9 Payment.	
902-7 BONDED WEARING COURSE (BWC) (GAP-GRADED).	
902-7.1 General	
902-7.1 General 902-7.2 Materials	
902-7.2.1 General	
902-7.2.2 Polymer Modified Asphalt Emulsion.	
902-7.2.3 Polymer Modified Gap Graded (PMGG) Hot Mix.	

902-7.2.3.1 General	R-102
902-7.2.3.2 Job Mix Formula (JMF)	R-103
902-7.2.3.3 Aggregate	R-103
902-7.2.3.4 Polymer Modified Paving Asphalt	R-103
902-7.2.3.5 Composition and Grading	
902-7.2.3.6 Aggregate Storing, Drying and Screening	R-106
902-7.2.3.7 Proportioning	
902-7.2.3.8 Mixing	
902-7.2.3.9 Storage	R-106
902-7.2.3.10 Miscellaneous Requirements	R-106
902-7.3 Placement Equipment.	
902-7.3.1 General	
902-7.3.2 Material Transfer Vehicle (MTV).	R-106
902-7.3.3 Integral Paving Machine	
902-7.3.4 Rollers	
902-7.3.5 Trucks	R-107
902-7.4 Placement.	R-107
902-7.4.1 General	
902-7.4.2 Pre-Paving Conference	
902-7.4.4 Surface Preparation.	
902-7.4.5 Polymer Modified Asphalt Emulsion Membrane	
902-7.4.6 Polymer Modified Gap-Graded (PMGG) Hot Mix	
902-7.4.7 Joints	
902-7.4.8 Rolling.	
902-7.4.9 Traffic Readiness.	
902-7.4.10 Measurement.	
902-7.4.11 Payment	
SECTION 903 - RECYCLED ASPHALT CONCRETE	
903-1 COLD-IN-PLACE RECYCLED APHALT CONCRETE PAVEMENT (CIRACP)	D 440
903-1.1 General	
903-1.2 Submittals	
903-1.3 Materials	
903-1.3.1 General	
·	
903-1.3.3 Emulsified Recycling Agent	R-111
903-1.3.3 Emulsified Recycling Agent	R-111 R-113
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113 R-113
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113 R-113 R-114
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113 R-113 R-114
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113 R-113 R-114 R-115
903-1.3.3 Emulsified Recycling Agent	R-111 R-113 R-113 R-113 R-113 R-114 R-115 R-115
903-1.3.3 Emulsified Recycling Agent	R-111R-113R-113R-113R-114R-115R-115
903-1.3.3 Emulsified Recycling Agent	R-111R-113R-113R-113R-114R-115R-115R-115
903-1.3.3 Emulsified Recycling Agent. 903-1.3.4 Water. 903-1.3.5 Additive. 903-1.3.6 Emulsified Asphalt. 903-1.3.7 Sand. 903-1.4 Mix Design. 903-1.4.1 General. 903-1.4.2 Emulsified Recycling Agent Percentage. 903-1.4.2.1 General. 903-1.4.2.2 Core Samples. 903-1.4.2.3 Mixing Specimen Size. 903-1.4.2.4 Number of Specimens. 903-1.4.2.5 Compaction of Specimens.	R-111R-113R-113R-113R-114R-115R-115R-115R-115
903-1.3.3 Emulsified Recycling Agent	R-111R-113R-113R-113R-114R-115R-115R-115R-116R-116

903-1.4.2.8 Marshall Retained Stability	R-117
903-1.4.2.9 Raveling Test on Recycled Asphalt Specimens	
903-1.4.3 Mix Design Submittal.	
903-1.5 Equipment	
903-1.5.1 General.	
903-1.5.2 Cold Milling Machine.	
903-1.5.3 Crushing and Screening Equipment	
903-1.5.4 Mixing and Proportioning Unit.	
903-1.5.4.1 General	
903-1.5.4.2 Pugmill.	
903-1.5.5 Water Storage and Supply Equipment	R-119
903-1.5.6 Cement or Lime Storage and Supply Equipment	
903-1.5.7 Distribution and Spreading	
903-1.5.8 Rollers.	
903-1.6 Quality Control Program.	
903-1.6.1 General.	
903-1.6.2 Quality Control Plan (QCP).	
903-1.6.6 Inspection, Sampling, Testing, and Reporting	
903-1.7 Just-In-Time Training (JITT)	
903-1.7.1 General	
903-1.7.2 Class Requirements	
903-1.8 Production and Placement.	
903-1.8.1 General	
903-1.8.2 Sequence of Work	
903-1.8.3 Pre-Paving Conference	
903-1.8.4 Roadway Surface Preparation.	
903-1.8.5 Cold Milling, Crushing, and Screening.	
903-1.8.6 Mixing and Proportioning.	
903-1.8.7 Mixing and Spreading Cement and Lime.	
903-1.8.7.1 General	
903-1.8.7.2 Proportioning Cement or Lime Slurry.	
903-1.8.8 Spreading	
903-1.9 Compaction	R-127
903-1.9.1 General	
903-1.9.2 Initial Compaction and Initial In-Place Density.	
903-1.10 Test Strip	R-128
903-1.10.1 General	R-128
903-10.2 Approval	R130
903-1.11 Fog Seal coat and Sand Cover	R-130
903-1.12 Curing, Maintenance, and Protection	
903-1.13 Supplemental Compaction	R-130
903-1.14 Measurement	
903-1.15 Payment	
903-2 COLD CENTRAL-PLANT RECYCLED ASPHALT CONCRETE F	
(CCPRACP)	
903-2.1 General	R-133
903-2.2 Submittals.	
903-2.3 Materials	
903-2.3.1 General	
903-2.3.2 Reclaimed Asphalt Pavement (RAP	
903-2.3.3 Emulsified Recycling Agent	
903-2.3.4 Water.	

903-2.3.5 Additive	R-135
903-2.3.6 Emulsified Asphalt	
903-2.3.7 Mix Design.	
903-2.4 Mix Design.	
903-2.4.1 General.	
903-2.4.2 Emulsified Recycling Agent Percentage.	
903-2.4.2.1 General.	
903-2.4.2.1 General 903-2.4.2.2 Core Samples 903-2.4.2.2 Core Samples 903-2.4.2.2 Core Samples 903-2.4.2.1 General 903-2.4.2.1 General 903-2.4.2.1 General 903-2.4.2.1 General 903-2.4.2.1 General 903-2.4.2.1 General 903-2.4.2.2 Core Samples 903-2.4.2 Core Samples 903-2.2 Core Samples 9	
903-2.4.2.3 Mixing Specimen Size.	
903-2.4.2.4 Number of Specimens	
903-2.4.2.5 Compaction of Specimens.	K-139
903-2.4.2.6 Curing Specimens after Compaction	
903-2.4.2.7 Measurements.	
903-2.4.2.8 Marshall Retained Stability	
903-2.4.2.9 Raveling Test on Recycled Asphalt Specimens	
903-9.5.3 Mix Design Submittal.	
903-2.5 Equipment	
903-2.5.1 General	
903-2.5.2 Cold Milling Machines.	
903-2.5.3 Crushing and Screening Equipment	
903-2.5.4.1 General	
903-2.5.4.2 Pugmill	R-142
903-2.5.5 Water Storage and Supply Equipment	R-142
903-2.5.6 Cement or Lime Storage and Supply Equipment	R-142
903-2.5.7 Distribution and Spreading	
903-2.5.7 Rollers	R-143
903-2.6 Quality Control Program	R-143
903-2.6.1 General	R-143
903-2.6.2 Quality Control Plan (QCP)	R-143
903-2.6.6 Inspection, Sampling, Testing, and Reporting	
903-2.7 Just-In-time Training (JITT)	
903-2.7.1 General	
903-2.7.2 Class Requirements	
903-2.7.3 Submittals.	
903-2.8 Production.	
903-2.8.1 General	
903-2.8.2 Sequence	
903-2.8.3 Cold Milling	
903-2.8.4 Crushing and Screening.	R-147
903-2.8.5 Stockpiling	
903-2.8.6 Mixing and Proportioning.	R-148
903-2.9.1 Sequence	
903-2.9.2 Pre-Paving Conference	
903-2.9.5 Spreading and Finishing	
903-2.9.6 Compaction.	
903-2.9.6 Compaction	
903-2.9.6.2 Initial Compaction and Initial In-Place Density.	
903-2.10 Production and Placement Verification Day (PPVD)	
903-2.10.1 General	
903-2.10.2 Approval	
903-2.11 Fog Seal Coat and Rock Dust Blotter Cover.	
903-2.12 Curing, Protection, and Maintenance	K-153

903-2.14 Measurement		
SECTION 904 - POLYMER MODIFIED EMULSION (PME) CHIP SEAL		.00
904-1 GENERAL	R-	156
904-2 MATERIALS.		
904-2.1 Polymer Modified Emulsion (PME)		
904-2.1.1 General		
904-2.1.2 Certificate of Compliance.		
904-2.2 Screenings.		
904-2.2.1 General		
904-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings	R-	157
904-2.3 Flush Coat		
904-2.3.1 Emulsified Asphalt	R-	157
904-2.3.2 Sand	R-	157
904-3 EQUIPMENT		
904-4 ROADWAY SURFACE PREPARATION		
904-5 TEMPORARY TRAFFIC CONTROL		
904-6 APPLICATION AND SPREADING.		
904-6.1 General		_
904-6.2 Polymer Modified Emulsified Asphalt (PME)		
904-6.3 Screenings.		
904-7 FINISHING		
904-8 FLUSH COAT 904-9 MAINTENANCE		
904-10 MEASUREMENT.		
904-10 MEASUREMENT		
904-11 1 ATIVILIN1	1\-	100
SECTION 905 - ASPHALT REJUVENATING EMULSION (ARE) CHIP SEA	۸L	
905-1 GENERAL	R-	159
905-2 MATERIALS		
905-2.1 Asphalt Rejuvenating Emulsion (ARE)	R-	159
905-2.1.1 Ġeneral		
605-2.1.2 Rejuvenating Agent	R-	161
905-2.1.3 Polymer		
905-2.1.4 Certificate of Compliance.		
905-2.2 Screenings.		
905-2.2.1 General		
905-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings		
905-2.3 Flush Coat		
905-2.3.1 Emulsified Asphalt		
905-2.3.2 Sand		
905-3 EQUIPMENT905-4 ROADWAY SURFACE PREPARATION		
905-5 TEMPARARY TRAFFIC CONTROL.		
905-6 APPLICATION AND SPREADING		
905-6.1 General.		
905-6.2 Asphalt Rejuvenating Emulsion (ARE)	R-	162
905-6.3 Screenings.		
905-7 FINISHING		

905-8 FLUSH COAT	
905-9 MAINTENANCE	
905-10 MEASUREMENT	
905-11 PAYMENT	R-163
SECTION 906 - SCRUB SEAL COAT	-
906-1 GENERAL	R-164
906-2 MATERIALS	R-164
906-2.1 Asphalt Rejuvenating Emulsion (ARE)	R-164
906-2.1.1 General	
906-2.1.2 Rejuvenating Agent	
906-2.1.3 Polymer	
906-2.1.4 Certificate of Compliance	
906-2.2 Screenings	
906-2.2.1 General	
906-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings	
906-3 EQUIPMENT	R-166
906-4 ROADWAY SURFACE PREPARATION	
906-5 TEMPORARY TRAFFIC CONTROL	
906-6 APPLICATION AND SPREADING	
906-6.1 General	K-16/
906-6.2 Asphalt Rejuvenating Emulsion (ARE)	
906-6.3 Screenings	
906-8 FLUSH COAT	
906-8 FLOSH COAT	
906-10 MEASUREMENT.	
906-11 PAYMENT	
000 11 1 / (10) E101	
SECTION 907 - TIRE RUBBER MODIFIED PAVING ASPHAL	T (TRMPA) CHIP SEAL
907-1 GENERAL	
907-2 MATERIALS	
907-2.1 Tire Rubber Modified Paving Asphalt (TRMPA)	
907-2.1.1 General	
907-2.1.2 Certificate of Compliance	
907-2.2 Pre-Coated Screenings	
907-2.3 Flush Coat	
907-2.3.1 Emulsified Asphalt	
907-2.3.2 Sand	
907-3 EQUIPMENT	
907-4 ROADWAY SURFACE PREPARATION	
907-5 TEMPARARY TRAFFIC CONTROL	
907-6 APPLICATION AND SPREADING	
907-6.1 General	
907-6.2 Tire Rubber Modified Paving Asphalt (TRMPA)	
907-6.3 Pre-Coated, Pre-Heated Screenings	
907-7 FINISHING	
907-8 FLUSH COAT	

907-10 MEASUREMENT	_
SECTION 908 - POLYMER MODIFIED EMULSIFIED ASPHALT-RECLAI ASPHALT PAVEMENT AGGREGATE SLURRY SEAL (PMERAPAS	
908-1 GENERAL	
908-2 MATERIALS	
908-2.1 Polymer Modified Emulsified Asphalt (PME)	
908-2.2 Reclaimed Asphalt Pavement (RAP) Slurry Seal Aggregate	
908-2.2.1 General	
908-2.2.2 Grading	
908-2.2.3 Water	
908-2.2.4 Set Control Agents	
908-4 CONTINUOUS-FLOW MIXERS.	
908-5 SCHEDULING, PUBLIC CONVENIENCE, AND TRAFFIC CONTROL	
908-6 SPREADING AND APPLICATION	
908-6.1 General.	
908-6.2 Spreading and Application.	R-176
908-7 FIELD SAMPLING AND TESTING.	R-176
908-8 MEASUREMENT.	
908-9 PAYMENT	
908-9.1 General	R-178
908-9.2 Payment Reduction for Noncompliance	R-180
908-9.2.1 General	R-180
908-9.2.2 Reduction in Payment Based on WTAT	R-180
SECTION 909 - MICROSURFACING	
000 4 CENEDAL	D 404
909-1 GENERAL	
909-2.1 Microsurfacing Emulsion (MSE)	
909-2.1 Wilcosunacing Emulsion (WSE)	
909-2.3 Mineral Filler	
909-2.4 Aggregate	
909-2.5 Mix Design	
909-2.6 Proportioning.	
909-3 MIXING AND SPREADING EQUIPMENT	
909-3.1 General	
909-3.2 Mixer-Spreader Machines.	
909-3.2 Mixer-Spreader Trucks	
909-3.3 Spreader Box	R-187
909-3.4 Wheel Path Depression (Rut) Box	R-188
909-4 JUST-IN-TIME-TRAINING (JITT)	R-188
909-5 PREPARATION FOR MICROSURFACING	R-188
909-6 PLACEMENT.	
909-7 TRAFFIC CONTROL.	
909-8 TEST STRIP.	R-191
909-9 MEASUREMENT.	
909-10 PAYMENT	
ATTACHMENT 1	R-192

PART 1 GENERAL PROVISIONS

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. Add the following:

[Include the following only if there are roadside mailboxes within the Project limits:]

The Contractor shall maintain all existing roadside mailboxes in an erect and functional position and condition at all times during the construction duration, including when in temporary locations if necessary. Block-outs shall be left in new sidewalk, where required, as directed by the Engineer. The Contractor shall install mailboxes and mailbox posts furnished by the mailbox owners in their permanent locations in accordance with Standard Plan 101. Damaged or lost mailboxes and posts shall be replaced by the Contractor at its own expense.

[End inclusion.]

[Include the following if there are sprinkler systems within the parkway areas:]

Sprinkler systems damaged by the Contractor's operations shall immediately be replaced and rehabilitated by the Contractor at its own expense. Vegetation damaged as a result of the sprinkler system being damaged due to the Contractor's operations shall be restored by the Contractor at its own expense. The Contractor shall completely replace and rehabilitate any interfering sprinkler system, including relocating sprinkler heads to the back of sidewalk, in order to produce a fully functional system. Payment for removing, modifying, or restoring sprinkler systems, including the relocation of sprinkler heads, shall be considered as included in the prices in the Bid for the various items of work.

[End inclusion.]

[Include the following if the Work includes removal of a portion of existing masonry block walls:]

Severed ends of block walls shall be rebuilt in-kind at the property line. Half-block voids shall be filled with half-blocks and the exposed ends of walls shall be finished in a neat and workmanlike manner, as directed by the Engineer.

[End inclusion.]

[Include the following if fence or railing relocation is shown on the Plans. Ensure the appropriate Bid item is included on the Engineer's Estimate.]

Fence or railing designated on the Plans to be relocated shall be inspected and its existing condition verified by the Engineer prior to the start of the Work. Fence or railing to be relocated shall be removed and stored until ready for reinstallation. Reinstallation shall be in-kind, in the permanent location indicated on the Plans. Posts, rails, tension rods and wires, boards, fabric, gates, barbed wire, footings and other facilities shall be of a size, strength and condition equal to, or better than, the condition prior to removal. Any material damaged during removal, storage, or reinstallation shall be replaced by the Contractor at its own expense.

Payment for fence or railing relocation shall be considered as included in the Contract Unit Price for the appropriate item(s) for relocating fence or railing. If no such items are included in the Bid, payment shall be considered as included in the prices in the Bid for the various items of work.

[End inclusion.]

PART 2 CONSTRUCTION MATERIALS

SECTION 200 - ROCK MATERIALS

200-1 ROCK PRODUCTS.

200-1.6 Stone for Riprap.

200-1.6.1 General. Delete the second paragraph.

200-1.6.2 Grading Requirements. Replace Table 200-1.6.2 with the following:

TABLE 200-1.6.2

	Percentage Larger Than				
Rock Size	1000 lb Class	500 lb Class	Light Class	Facing Class	Cobble Class
2000 lb (900 kg)	0-5	-	-	-	-
1000 lb (450 kg)	50-100	0-5	-	-	-
500 lb (225 kg)	90-100	50-100	0-5	-	-
200 lb (90 kg)	95-100	90-100	50-100	0-5	-
75 lb (35 kg)	-	-	90-100	50-100	0-5
25 lb (10 kg)	-	95-100	-	90-100	95-100

[Include 200-3 if the Engineer's Estimate includes a Bid item for "Imported Borrow," "Imported Backfill," or "Structure Backfill."]

Add the following subsection:

200-3 IMPORTED FILL MATERIAL.

- **200-3.1 General.** The Contractor shall implement the following sampling and analysis requirements prior to importing fill material (imported borrow, structure backfill, and imported backfill) to the Project site.
- **200-3.2 Sampling Frequency and Location.** The Contractor shall collect discrete soil samples that are representative of the material to be imported. The Contractor shall establish a grid system over the potential borrow site or stockpile. The Contractor shall collect and analyze one soil sample from each grid. The grid and soil sampling frequency shall be as follows:

TABLE 200-3.2

Volume of Soil	Number of Grids/Samples	
1 to 20 cubic yards	1 sample	
21 to 500 cubic yards	1 sample every 50 cubic yards	
501 to 1,000 cubic yards	1 sample every 100 cubic yards	
>1,000 cubic yards	1 sample every 200 cubic yards	

All sampling shall be conducted by qualified personnel under strict chain-of-custody procedures, and analyzed by a State of California Environmental Laboratory Accreditation Program (ELAP)-certified laboratory in accordance with the testing procedures specified in 40 CFR 136.

200-3.3 Soil Sample Analysis. All sample analysis, containers, preservation methods, and holding times for soil samples shall be in accordance with test procedures provided by 40 CFR 136 and EPA Publication SW-846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," Third Edition, November 1986.

Soil samples shall be transported, under strict chain-of-custody procedures, to an ELAP-certified analytical laboratory within 24 hours of collection. The soil samples shall be analyzed for the following constituents:

TABLE 200-3.3

Constituent	EPA Method
Total Recoverable Petroleum Hydrocarbons (TRPH).	EPA Test Method 418.1
Total Petroleum Hydrocarbons (TPH-G) - Gasoline Range C4- C12	Modified EPA Test Method 8015
Total Petroleum Hydrocarbons (TPH-D) - Diesel Range C10-C24	Modified EPA Test Method 8015
Volatile Organic Compounds (VOCs)	EPA Test Method 8260
CCR Title 22 Metals (TTLC)	EPA Method 6010
Simulated Distillation – Hydrocarbon Distribution. Hydrocarbon Chain	EPA Test Method 3550

If the Contractor is aware of other potential contaminants, or the borrow site or stockpile history may indicate other potential contaminants not listed above, the Contractor shall analyze all samples for all other potential contaminants.

Based on the results of the tests, the Engineer may require additional or supplemental soil samples be collected and tested in order to determine whether the proposed imported fill material is acceptable.

200-3.4 Quality Control. One duplicate soil sample shall be collected and analyzed for every ten-soil samples collected and analyzed. If less than ten samples are collected, a minimum of one duplicate sample is required. Duplicate samples shall be collected in separate containers and located immediately adjacent to the original sample location(s).

Any soil samples having a dilution factor of greater than one will be rejected by the Engineer. The Agency reserves the right to approve and observe all sampling, loading, and transportation of soil proposed to be imported.

200-3.5 Reporting and Documentation. Prior to the acceptance of the imported fill material, the Contractor shall submit to the Engineer a summary report of all analytical data from soil sampling activities conducted on the proposed fill material. The report shall include a table summarizing all analytical data and observations, a sketch drawing or diagram of the borrow/stockpile site and sample locations, general soil conditions or classification, description of the borrow/stockpile site, signed laboratory analytical data sheets, signed laboratory analytical QA/QC data sheets, signed/completed chain-of-custody forms, field logbook, and all other pertinent information.

The Contractor shall maintain a bound sample documentation logbook. The logbooks will be used for documenting data collection and work activities. Entries shall be made in ink and shall include sufficient detail to reconstruct site activities without reliance on memory. All samples collected shall be recorded in the logbook.

200-3.6 Approval. The Engineer will evaluate the data submitted in this report and determine if the proposed material may be imported and used on the Project. The Contractor shall not import any soil on to the Project site until the Agency has reviewed the summary report and written approval has been received from the Engineer.

200-3.7 Payment. Payment for sampling and analysis of imported fill material shall be considered as included in the Contract Unit Price for the Bid item(s) for imported fill material.

SECTION 203 – BITUMINOUS MATERIALS

203-5 SLURRY SEAL.

203-5.4 Emulsion-Aggregate Slurry (EAS).

203-5.4.2 Materials.

203-5.4.2.2 Emulsified Asphalt. Replace the first paragraph with the following:

Emulsified asphalt shall be quick-set, grade PMCQS-1h conforming to the requirements shown in Table 203-5.4.2.2 (B).

Table 203-5.4.2.2 (B)

Property	Test method	Value	
		Min	Max
Tests on emulsion:			
Saybolt Furol Viscosity @	AASHTO T 59	15	90
25 °C, SFS ¹			
Sieve test, %	AASHTO T 59		0.30
Storage stability, 1 day, %	AASHTO T 59		1
Residue by evaporation, %	California Test 331	57	
Particle charge	AASHTO T 59	Posit	ive
Tests on residue by			
evaporation test			
Penetration, 25 °C	AASHTO T 49	40	90
Ductility, 25 °C, mm	AASHTO T 51	400	
Torsional recovery, %	California Test 332	18	
Or			
Polymer content, %	California Test 401	2.5	

Notes:

- 1. SFS means Saybolt Furol seconds.
- 2. Either neoprene polymer or butadiene and styrene copolymer shall be used. The polymer must be homogeneous and milled into the emulsified asphalt at the colloid mill.

[Include the following if asphalt concrete for any application is shown on the Plans. Ensure the appropriate Bid item(s) is (are) included in the Engineer's Estimate.]

203-6 ASPHALT CONCRETE.

203-6.1 General. Replace the entire subsection with the following:

Asphalt concrete shall be the product of mixing mineral aggregate and up to 25 percent reclaimed asphalt pavement (RAP) with asphalt binder at a central mixing plant. Asphalt concrete for placement as a surface course may contain up to 20 percent RAP. For all other placement applications, asphalt concrete may contain up to 25 percent RAP.

At the Contractor's option, asphalt concrete may be produced using a warm mix asphalt technology conforming to 203-6.7.2.

Asphalt concrete mixtures shall conform to 203-6.4.

[Do not include the following if the class and grade is shown on the Plans:]

203-6.2 Materials.

203-6.2.1 Asphalt Binder. Replace the first sentence with the following:

The asphalt binder to be mixed with the aggregate shall be paving asphalt conforming to 203-1. Unless otherwise shown on the Plans, the binder grade shall be as shown in Table 203-6.2.1.

TABLE 203-6.2.1

Area	Binder Grade
South Coast (Los Angeles Basin, Santa Clarita Valley, Santa Monica Mountains)	PG 64-10
South Mountain (Angeles National Forest)	PG 64-16
High Desert (Antelope Valley)	PG 70-10

[End binder grade inclusion.]

203-6.7 Production.

203-6.7.2 Warm Mix Asphalt (WMA) Technologies. Replace the first paragraph with the following:

At the Contractor's option, asphalt concrete mixtures may be produced using a WMA technology. The WMA technology used shall be on the Caltrans list of approved technologies for warm mix asphalt in effect as of the date of advertisement of the contract, http://www.dot.ca.gov/hq/esc/approved_products_list/pdf/wma_list.pdf. Either an additive technology or a water injection technology may be used.

Add the following:

When using a WMA technology, asphalt concrete mixtures shall be produced within the temperature range of 250 to 290°F.

[End asphalt concrete inclusions.]

[Include the following if the Plans show Asphalt Rubber Hot Mix. Ensure Bid items for "Asphalt Rubber Hot Mix" and "Asphalt Rubber Hot Mix (Test Strip)" (if over 4,000 tons) are included in the Engineer's Estimate.]

203-11 ASPHALT RUBBER HOT MIX (ARHM).

203-11.2 Materials. Add the following:

Certificates of Compliance shall conform to 4-1.5 and be submitted to the Office Engineer named in 2-5.3 of Section G. Certificates of Compliance for the paving asphalt and asphalt modifier shall be submitted prior to the start of asphalt rubber hot mix production. The Certificate of Compliance for the crumb rubber modifier shall be submitted no later than 1 week following completion of asphalt rubber hot mix production.

203-11.2.3 Crumb Rubber Modifier (CRM). Replace the fourth sentence of the first paragraph with the following:

Whole scrap tire CRM shall be derived from whole scrap tires generated within the State of California.

[Include the following if ARHM is to be produced using a WMA technology:]

Add the following:

- **203-11.2.5 Warm Mix Asphalt (WMA) Additives.** The WMA technology shall be one of the following WMA additives:
 - a) "Evotherm" produced by MeadWestvaco Asphalt Innovations, <u>www.evotherm.com</u>. Contact Scott Dymtrow, (916) 825-9415, or Wade Miller, (949) 495-4822.
 - b) "Sasobit" produced by Sasol Wax Americas, inc, www.sasobit.com. Contact Larry Michael, (310) 745-3334.

- c) "Advera WMA" produced by PQ Corporation, www.adverawma.com. Contact Annette Smith, (610) 651-4469.
- d) "Rediset WMX" produced by Akzo Nobel Surface Chemistry, LLC, www.surfactants.akzonobel.com. Contact Raymond Hess, (949) 551-4469.

The WMA technology producer shall have a technical representative at the plant and on the Work site throughout the duration of warm mix ARHM production and placement unless otherwise approved by the Engineer.

[End WMA technology inclusion.]

203-11.3 Composition and Grading. Replace Table 203-11.3 with the following:

TABLE 203-11.3
REQUIREMENTS FOR ARHM-GG

	CLASS		
SIEVE SIZE	GG-B Min Max.	GG-C	GG-D Min Max.
48.40-		wiin wax.	wiin wax.
1" (25 mm)	100	-	_
3/4" (19.0 mm)	90-100	100	_
1/2 " (12.5 mm)	_	90-100	100
3/8 " (9.5 mm)	60-75	78-92	78-92
No. 4 (4.5 mm)	28-42	28-42	28-42
No. 8 (2.36 mm)	15-25	15-25	15-25
No. 30 (600 μm)	5-15	5-15	5-15
No. 200 (75 μm)	0-5	2-7	2-7
Asphalt Rubber Binder, % by Weight of Dry Aggregate ¹	7.8 -8.4	7.8 -8.7	7.8 -8.7
Air Voids %, California Test 367	3-6	3-6	3-6
Stabilometer Value, California Test 304 and 306, Min.	25	23	23
Voids in Mineral Aggregate, %, Min. ²	18	18	18

^{1.} Once the percent asphalt rubber binder is determined by the mix design, the production tolerance shall be \pm 0.5% as determined by California Test Method 362, 379, or 382.

[Include the following if ARHM is to be produced using a WMA technology:]

203-11.4 Mixing Paving Asphalt and CRM. Add the following before the first paragraph:

203-11.4.1 General. Replace the third and fourth paragraphs with the following:

The proportions of the materials, by total weight of asphalt rubber binder, shall be 80 percent \pm 2 percent combined paving asphalt, asphalt modifier and WMA additive, and 20 percent \pm 2 percent CRM. The minimum amount of CRM shall be 18 percent. Paving asphalt, asphalt modifier, WMA technology additive, and CRM shall be proportioned and mixed in blending equipment conforming to 203-11.5. The temperature of the blended

^{2.} Percent voids in the mineral aggregate (VMA) is to be determined during the mix design process only and is to be calculated on the basis of ASTM bulk specific gravity as described in the Asphalt Institute MS-2 manual.

paving asphalt, asphalt modifier, and WMA additive shall be between 375°F and 400°F when the CRM is added. The resulting asphalt-rubber binder shall be pumped into a storage/reaction tank conforming to 203-11.5 and reacted for 45 minutes minimum at a temperature between 350°F and 400°F. After reacting, the asphalt-rubber binder shall conform to the requirements shown in Table 203-11.4.

The temperature of the asphalt rubber binder shall be maintained between 350°F and 400°F after reacting. If any of the material in a batch is not used within 4 hours after reacting, heating of the material shall be discontinued. Reheating will not be permitted.

Delete the fifth and sixth paragraphs.

Add the following:

203-11.4.2 WMA Additives. WMA additives shall be proportioned by weight. The plant process controller shall be the sole source of ingredient proportioning control and meters used in the production process.

Weighing and metering devices used for the production of warm mix ARHM shall conform to the requirements of the Caltrans Material Plant Quality Program (MPQP). When a loss-in-weight meter is used, it shall conform to the requirements of the MPQP and the following:

- a) Include at least one complete system re-fill cycle during each calibration test run.
- b) Operate the device in a normal run mode for 10 minutes immediately before starting the calibration process.
- c) Isolate the scale-system, within the loss-in-weight feeder, from surrounding vibration.
- d) Check the scale-system, within the loss-in-weight feeder, for accuracy before and after the calibration process and daily during mix production.
- e) For a dry ingredient delivery rate of less than one ton per hour use a 15 minute minimum test run size.
- f) The unit's accuracy must comply with the limits of Table B, "Conveyor Scale Testing Extremes," in the Caltrans MPQP.

Proportioning shall also conform to the following for the respective production methods:

g) Batch Plant Method. Metered liquid WMA additives must be placed in an intermediate holding vessel, and then be added to the mix with the asphalt rubber binder. Dry ingredient proportioning devices must be separate from metering devices for the aggregates and asphalt rubber binder.

Dry WMA additives must be proportioned directly into the pugmill or placed in an intermediate holding vessel to be added to the pugmill at the appropriate time in the batch cycle.

Zero tolerance for the WMA additive batch scale shall be \pm 0.1 percent of the asphalt rubber binder batch weight. The indicated WMA additive batch scale weight may vary from the preselected weight setting by up to \pm 0.02 percent of the asphalt rubber binder batch weight.

h) Drier-Drum Method. The plant process-controller in conjunction with the measuring systems must be capable of varying ingredient feed rates proportionately with the aggregate delivery, at all production rates and rate changes. Liquid WMA additives must enter the production stream with the asphalt rubber binder. Dry WMA additives must enter the production stream at or before the mixing area.

When dry WMA additives are utilized, back house dust systems must return all of the captured material to the mix.

WMA additives must be proportioned to within 0.2 percent of the target rate.

203-11.4.3 Asphalt Rubber Binder with Aggregate. Mixing asphalt rubber binder with aggregate shall conform to 203-6.7 except as follows:

- a) The temperature of the asphalt rubber binder at the time of mixing with the aggregate shall be 350°F minimum to 400°F maximum.
- b) The temperature of the aggregate at the time of mixing with the asphalt rubber binder shall be 300°F minimum to 325°F maximum.
- c) The temperature of the mixture at the point of discharge from the plant shall be 275°F minimum to 325°F maximum.

[End WMA technology inclusion.]

[Include 203-12 if the Plans show ARAM placement.]

203-12 ASPHALT RUBBER AND AGGREGATE MEMBRANE (ARAM).

203-12.2 Materials.

Add the following subsection:

203-12.2.4 Acceptance. Acceptance of asphalt rubber and screenings shall either be based on testing by the Agency for compliance with the Specifications, or by submission of a Certificate of Compliance conforming to 4-1.5, as determined by the Engineer.

If the screenings are produced at a plant 50 miles or less from the Project site, the Agency may test the screenings at the plant for compliance with the requirements of the Specifications. Testing, except for paving asphalt content, will be performed a minimum of 2 Working Days prior to the start of delivery of screenings to the Project site. Testing for paving asphalt content will be performed each day screenings are delivered to the Project site. The Engineer may waive the aforementioned testing and require submission of a Certificate of Compliance and supporting test data on screenings delivered to the

Project site. Submission shall be within 5 Working Days of completion of ARAM placement.

If the screenings are produced at a plant greater than 50 miles from the Project site, the Contractor shall submit a Certificate of Compliance and supporting test data on screenings delivered to the Project site. Submission shall be within 5 Working Days of completion of ARAM placement.

If the asphalt rubber is produced on or adjacent to the Project site, the Agency may perform Haake viscometer testing on each batch produced. The Engineer may waive the aforementioned testing and require submission of a Certificate of Compliance and supporting Haake viscometer test data for each batch of asphalt rubber produced and placed on the Project. Submission shall be within 5 Working Days of completion of ARAM placement.

If the asphalt rubber is produced greater than 50 miles from the Project site, the Agency will perform Haake viscometer testing at the Project site once the asphalt rubber is at the test temperature. Asphalt rubber which fails to conform to the requirements of the Specifications at the Project site will not be accepted for use on the Project.

[Include 203-14 if the Plans show TRMAC with either PG 64-28TR or PG 76-22TR.]

203-14 TIRE RUBBER MODIFIED ASPHALT CONCRETE (TRMAC).

203-14.2 Materials. Add the following subsection:

203-14.2.4 Performance Graded Tire Rubber Modified Paving Asphalt.

Performance graded tire rubber modified paving asphalt shall consist of paving asphalt containing ground scrap tire rubber. The scrap tire rubber shall be incorporated into the paving asphalt such that a smooth and homogeneous composition results. Performance graded tire rubber modified paving asphalt shall conform to the requirements shown in Table 203-14.2.4.

TABLE 203-14.2.4

Promodu	AASHTO Test	Specification Grade		
Property	Method	PG 64-28TR	PG 76-22TR	
	Original Bind	er		
Flash Point, Minimum °C	T 48	230	230	
Solubility, Minimum % b	T 44 ^c	98.5	97.5	
Viscosity at 135°C, ^d Maximum, Pa·s	T 316	3.0	3.0	
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	64 1.00	76 1.00	
RTFO Test , Mass Loss, Maximum, %	T 240	1.00	1.00	
	RTFO Test Aged	Binder		
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	64 2.20	76 2.20	
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum (delta), %	T 315	Note e 80	Note e 80	
Elastic Recovery ^f , Test Temp., °C Minimum recovery, %	T 301	25 75	25 65	
PAV ⁹ Aging, Temperature, °C	R 28	100	110	
	RTFO Test and PAV A	ged Binder		
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*sin(delta), kPa	T 315	22 5000	31 5000	
Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value	T 313	-18 300 0.300	-12 300 0.300	

Notes:

- a. Do not modify using acid modification.
- b. The Engineer will waive this specification if the supplier is a Quality Supplier as defined by the Caltrans' "Certification Program for Suppliers of Asphalt."
- c. ASTM D5546 may be used instead of AASHTO T 44.
- d. The Engineer will waive this specification if the supplier certifies the paving asphalt can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The Engineer also accepts direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
- f. Tests without a force ductility clamp may be performed.
- g. "PAV" means Pressurized Aging Vessel.

203-14.3 Composition and Grading. Add the following:

TRMAC to be produced using dense-graded combined aggregate gradations and performance graded tire rubber modified paving asphalt will be designated by class and grade as shown on the Plans, e.g. "C2-PG 76-22TR."

[End 203-14 inclusion.]

SECTION 206 - MISCELLANEOUS METAL ITEMS

206-6 CHAIN LINK FENCE.

206-6.1 General. Add the following after the first sentence of the second paragraph:

The caps shall be secured by spot welding or riveting.

SECTION 211 - MATERIAL TESTS

211-1 COMPACTION TESTS.

211-1.1 Laboratory Maximum Density. Replace the second and third paragraphs with the following:

Compaction tests will be performed in accordance with ASTM D1557 using the appropriate procedure based on the materials gradation where applicable. The Engineer may specify another procedure within this test; require the use of another test procedure; or specify a specific compaction method to be used where this test is not applicable.

All reported maximum densities shall be based on dry unit weight. However, the Engineer may modify the procedure in ASTM D1557, at its option, to calculate a relative compaction at the site based on adjusted laboratory maximum wet density to give the Contractor an indication of the achieved relative compaction. The adjusted laboratory maximum wet density will be calculated as follows:

211-1.3 Relative Compaction. Replace the entire subsection with the following:

The words "Relative Compaction" shall mean the ratio of the field dry density to the laboratory maximum dry density expressed as a percentage.

PART 3 CONSTRUCTION METHODS

SECTION 300 - EARTHWORK

300-1 CLEARING AND GRUBBING.

300-1.3 Removal and Disposal of Materials.

300-1.3.2 Requirements.

a) Bituminous Pavement. Add the following:

If the edge of trench is within 12 inches of the edge of an existing concrete gutter (including integral curb and gutter) or edge of concrete pavement, the existing bituminous pavement shall be completely removed and replaced to join the existing concrete edge of gutter (including integral curb and gutter), or edge of concrete pavement.

[Include the following paragraph if the Plans show existing AC pavement to be removed and new AC pavement to be constructed on existing base material:]

Existing bituminous pavement to be removed to accommodate new asphalt concrete pavement, as shown on the Plans, shall be removed by the use of cold milling machines.

c) Concrete Curb, Walk, Gutters, Cross Gutters, Driveways and Alley Intersections. Add the following:

Concrete removal shall include removal of existing asphalt concrete ramps adjacent to curb, gutter, sidewalk, driveways and curb ramps to be constructed.

Where portions of existing concrete are designated to be removed, cutting or removal will not be permitted until approved by the Engineer. Longitudinal saw cuts in the flow line of curb and gutter will not be allowed.

Add the following:

d) Tree Removal. Tree removal shall include stump and root removal. Trees designated for removal shall be "topped", or, if in the opinion of the Contractor, a tree is unable to withstand the strain of the topping procedure, the branches shall be lowered by some other means, such as a tree crane. Unless impractical, lower limbs shall be removed first, working toward the top until the tree is de-limbed. Stubs, at least 12 inches or more in length, shall be left following de-limbing to provide crotches for lowering sections of the trunk or main limbs.

Extreme care shall be taken to prevent limbs, branches, and trunks from falling and damaging adjacent structures, driveways, sidewalks, streets, fences, lawns and other property, both public and private. When necessary, brush mats, tires, logs or skids shall be used to prevent such damage.

Stump removal shall include grinding out the stump and all roots, including surface roots, to a minimum depth of 24 inches below existing ground level. Stump holes shall be backfilled with Class "A" Topsoil conforming to 800-1.1.2 and planted in accordance with 801 with grass seed or sod of the same variety as the adjacent lawn. Topsoil used for backfill shall be subject to the approval of the Engineer.

Chips and debris from stump removal shall be removed from the Project site by the end of the work day that such chips and debris were generated. No stump removal chips or debris shall be left on the parkway overnight. The Project site shall be raked and swept.

Add the following subsection:

300-1.3.3 Construction and Demolition Debris Recycling.

300-1.3.3.1 General. Consistent with the Agency's efforts to comply with the California Integrated Waste Management Act of 1989 (AB 939), the Contractor shall attempt to reduce, reuse, and/or recycle at least 50 percent by weight or volume or to the maximum extent feasible, the construction and demolition debris (debris) generated by this Contract thereby diverting the debris from disposal facilities, saving landfill space, and conserving virgin materials and natural resources.

300-1.3.3.2 Definitions.

- a) "Construction and Demolition Debris (Debris)" means materials resulting from building, construction or demolition-related activities such as excavation, grading, land clearing, renovation, repair, road work and site cleanup which are considered solid waste pursuant to Section 40191 of the California Public Resources Code. The materials include, but are not limited to, asphalt, brick, cardboard, carpet, cinder block, concrete, concrete with reinforcement bars, drywall, excavated materials, fixtures and fittings, glass, gravel, green waste, metal, mixed rubble, packaging materials, paper, plastics, porcelain, road work materials, roofing materials, rock, sand, site clearance materials, soil, trees, tree stumps and other vegetative matter, stones, and wood waste.
- **b)** "Deconstruction" means the process of carefully dismantling a structure, piece by piece prior to or instead of conventional demolition, to maximize the recovery of building materials for reuse and/or recycling.
- c) "Delivery Site" means a recycling facility as defined in Subsection E.14 and recycling or reuse site as defined in Subsection E.15 or any place, including a transfer station as defined in Subsection E.20 where the debris is delivered for the sole purpose of reuse and/or recycling in a manner acceptable to the Agency.
- d) "Disposal" means the process of disposing of debris at a Disposal Facility.
- e) "Disposal Facility" means a Landfill or any location where the debris is taken for "Transformation" as defined.

- **f)** "Generation" means the quantity of debris produced by the Work before the debris is reused and/or recycled.
- **g)** "Green Waste" means all vegetative cuttings, shrubs, stumps, logs, brush, tree trimmings, grass, and related materials which have been separated from other solid waste.
- h) "Landfill" means a solid waste disposal facility that accepts solid waste for land disposal and is operating under a current Solid Waste Facility Permit issued by a local enforcement agency as defined in Section 40130 of the California Public Resources Code and concurred upon by the California Integrated Waste Management Board.
- i) "Recyclable" means material that still has useful physical or chemical properties after serving its original purpose and that can be reused or re-manufactured into additional products.
- j) "Recycle or Recycling" means the process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste and returning them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace, and in a manner acceptable to the Agency. "Recycle" or "Recycling" does not include Transformation.
- **k)** "Recycling Facility" means any facility (except a transformation facility) whose principal function is to receive, store, convert, separate, or transfer recyclable materials for processing.
- I) "Recycling or Reuse Site" means any place other than a recycling facility acceptable to the Agency for recycling and/or reuse of debris.
- m) "Reduce" means any action which causes a net reduction in the generation and/or disposal of solid waste.
- n) "Reuse" means the use, in the form as it was produced, and in a manner acceptable to the Agency of material which might otherwise be discarded into a Disposal Facility.
- o) "Site Clearance Material" means materials such as trees, brush, earth, mixed concrete, rubble, sand, steel, extraneous paper, plastics, and other waste materials generated from site clearance.
- **p)** "Source Separation" means the segregation, by the generator, of materials designated for separate collection for materials recovery or special handling.

- q) "Transfer Station" means a facility utilized to receive solid wastes and to temporarily store, separate, convert, or otherwise process the materials in the solid wastes, and/or to transfer the solid wastes directly from smaller to larger vehicles or railroad trains for transport.
- **r)** "**Transformation**" means incineration, pyrolysis, distillation, gasification, or biological conversion other than composting.
- s) "Wood Waste" means solid waste consisting of wood pieces or particles which are generated from the manufacturing or production of wood products, harvesting, processing or storage of raw wood materials, or construction or demolition activities.

300-1.3.3.3 Recycling Summary. The Contractor shall prepare and submit a Recycling Summary report using the form included as Attachment 1 summarizing the disposal, reuse, and/or recycling activities which occurred throughout the Contract duration. This report shall be first faxed to the number shown on the report and also submitted to the Agency within 30 Days after Field Acceptance of the Work.

Failure of the Contractor to submit the Recycling Summary within the time specified will result in damages being sustained by the Agency. Such damages are, and will continue to be, impracticable and extremely difficult to determine. For failure to submit the Recycling Summary within the time specified, the Contractor shall pay to the Agency, or have withheld from monies due it, the sum of \$10,000.

Execution of the Contract shall constitute agreement by the Agency and Contractor that \$10,000 is the minimum value of the costs and actual damage caused by the failure of the Contractor to submit the Recycling Summary within the time specified. Such sum is liquidated damages and shall not be construed as a penalty, and may be deducted from payments due the Contractor.

300-1.4 Payment. Add the following:

Payment for construction and demolition debris recycling shall be considered as included in the Contract Unit Price for the various Bid items. As part of the Recycling Summary report, the Contractor shall fill in the blank after the "Construction Demolition and Debris Recycling Requirements Cost:" This cost shall be the incremental cost of complying with the aforementioned requirements. This cost will be used for information gathering purposes only and not for purposes of payment to the Contractor.

Unless otherwise specified, all trees to be removed having a trunk 6 inches in diameter or greater shall be paid for at the Contract Unit Price for "TREE REMOVAL." Said diameter shall be the smallest diameter measured 6 inches above the crown roots. Multi-trunk trees will be considered as one tree if any one trunk is 6 inches in diameter or greater. Payment for removal of all other trees shall be considered as included in the prices in the Bid for the other items of work.

The Contract Unit Price for "TREE REMOVAL" shall be considered as full compensation for cutting down and disposing of the entire tree including stump and root removal.

Payment for the removal of bituminous pavement will be made at the Contract Unit Price for "UNCLASSIFIED EXCAVATION."

Payment for the removal of bituminous pavement which overlays PCC pavement will be made at the Contract Unit Price for "CONCRETE REMOVAL (NON-REINFORCED)."

Payment for the removal of bituminous pavement shall be considered as included in the Contract Unit Price for "UNCLASSIFIED FILL."

Payment for the removal of non-reinforced concrete will be made at the Contract Unit Price for "CONCRETE REMOVAL (NON-REINFORCED)."

Payment for the removal of reinforced concrete will be made at the Contract Unit Price for "CONCRETE REMOVAL (REINFORCED)."

Replace the first sentence of the first paragraph with the following:

Payment for clearing and grubbing not covered by a specific Bid item, will be made at the lump sum Bid price for "CLEARING AND GRUBBING." The lump sum Bid price shall include payment for removal and disposal of all the resulting materials.

300-2 UNCLASSIFIED EXCAVATION.

300-2.8 Measurement. Add the following:

h) Removal of bituminous pavement.

[Include the following if a small quantity of unclassified excavation is required and only an "Unclassified Fill" item is included in the Engineer's Estimate:]

300-2.8 Measurement. Replace the entire subsection with the following:

Unclassified excavation will not be measured separately for payment.

300-2.9 Payment. Replace the entire subsection with the following:

There will be no separate payment for any Unclassified Excavation. Payment for such excavation shall be considered as included in the Contract Unit Price for "UNCLASSIFIED FILL."

[End inclusion.]

[Include the following if a small quantity of unclassified fill is required and only an "Unclassified Excavation" item is included in the Engineer's Estimate:]

300-4 UNCLASSIFIED FILL.

300-4.9 Measurement. Replace the entire subsection with the following:

Unclassified fill will not be measured separately for payment.

300-4.10 Payment. Replace the first sentence of the first paragraph with the following:

There will be no separate payment for any Unclassified Fill. Payment for such fill shall be considered as included in the Contract Unit Price for "UNCLASSIFIED EXCAVATION."

[End inclusion.]

300-5 BORROW EXCAVATION

[Include the following if the Engineer's Estimate includes an item for "Imported Borrow" and the Plans show imported borrow to be placed along roadway shoulders after resurfacing:]

300-5.3 Placing and Compacting. Add the following:

Imported borrow shall be placed and compacted as shoulder material when sufficient existing material is not present, when so designated on the Plans, or when so directed by the Engineer.

[End inclusion.]

300-5.4 Measurement and Payment. Replace the second sentence with the following:

Imported borrow will be measured by the cubic yard.

Add the following:

Payment for imported borrow will be made at the Contract Unit Price per cubic yard for "IMPORTED BORROW." The Contract Unit Price shall include furnishing, placing, and compacting imported borrow.

300-11 STONEWORK FOR EROSION CONTROL.

300-11.1 General. Add the following:

These specifications shall apply to stonework on level surfaces as well as on sloped surfaces. The rock class shall be as shown on the Plans.

300-11.2 Placing Stone. Replace the first sentence with the following:

Stone for erosion control on sloped surfaces shall be placed in accordance with the following method:

Add the following as the last paragraph:

On level surfaces, the rock may be placed by dumping, but shall not be spread by such a means that would cause it to break apart and not meet its specified grading requirements. Rock shall be so placed as to provide a minimum of voids without segregation.

300-11.3 Concreted Stone Slope Protection.

300-11.3.1 Concrete. Replace Table 300-11.3.1 with the following:

Rock Class 1000 lb 500 lb Light Facing Cobble Minimum Concrete 18 14 10 6 Penetration in inches (mm) (205)(465)(355)(255)(155)

TABLE 300-11.3.1

- **300-11.4 Measurement and Payment.** Replace the entire subsection with the following:
- **300-11.4.1 Measurement.** Stone and stonework for erosion control will be measured by the cubic yard of stonework in place.
- **300-11.4.2 Payment.** Payment for stone and stonework for erosion control will be made at the Contract Unit Price per cubic yard for "RIPRAP" for each rock class.

Payment for stone and stonework for concreted stone slope protection will be made at the Contract Unit Price per cubic yard for "CONCRETED RIPRAP" for each rock class and shall include payment for furnishing and placing the specified class of rock and concrete.

Add the following subsection(s):

300-12 GEOTEXTILES FOR STABILIZATION.

300-12.1 General. Add the following:

Geotextiles for stabilization shall be Mirafi HP 370, or Agency-approved equal. The Contractor shall submit supporting information in accordance with 2-5.3.4 of Section G.

300-12.2 Placement. Placement shall conform to 300-10.1.1.

300-12.3 Measurement and Payment. Geotextiles for stabilization will be measured by the square yard of fabric placed, not including any fabric for overlaps or splices.

Payment for geotextiles for stabilization will be made at the Contract Unit Price for "STABILIZATION GEOTEXTILE."

300-13 ROOT PRUNING.

300-13.1 General. Root pruning shall conform to SPPWC Standard Plan 523 and the provisions herein. Root control barriers shall conform to 300-13.2. Trees to be root pruned shall be trimmed by the crown reduction method in accordance with 300-13.3. Root pruning and tree trimming shall be performed by ISA Certified Tree Workers. Supporting information for root control barriers and root sealer fabric shall be submitted in accordance with 2-5.3.4 of Section G.

Root pruning equipment shall be specifically designed for this purpose, sharpened adequately to sever roots in a clean manner, and equipped with padded tracks or rubber tires to prevent scraping or marking of the roadway or curbs.

Roots shall be pruned immediately adjacent to the edge of the curb. Cuts shall be at the back of curb and shall be 4 inches wide and 18 inches deep as measured from the top of curb. The cuts shall extend 6 feet in each direction along the curb from the center of the tree trunk for a total length of 12 feet or as directed by the Engineer. When root pruning adjacent to sidewalk is required, the same details shall apply.

Root sealer fabric shall be applied to cut root areas which are larger than 2 inches in diameter. The root sealer fabric shall be "Bio Barrier," www.biobarrier.com/, or Agency-approved equal. Root sealer fabric shall be applied as soon as practical after the cuts have been made.

The Contractor shall repair or replace utility service connections and sprinkler systems within the right-of-way which are damaged or removed as a result of root pruning operations. Repairs shall be initiated immediately upon the occurrence of damage or removal and completed by the end of each working day. Repairs and replacements shall be the equivalent of, or better than, the existing improvements in material, dimension, and function. Repair and replacement shall be at the Contractor's expense and to the satisfaction of the Engineer.

300-13.2 Root Control Barriers. Root control barriers (barriers) shall conform to Note 11 of SPPWC Standard Plan 520. Barriers shall be approved by the Engineer prior to use. Barriers shall be installed at each location immediately following root pruning. Barriers shall extend the full 12-foot length of the root pruning cut or to the length determined by the Engineer.

Barriers may be one continuous piece or be securely connected at splice points. Barriers shall be installed in accordance with the manufacturer's instructions and shall not be used as a form.

Barriers shall be located adjacent to the cut roots. Backfill shall not be placed until barriers are in place, either immediately upon completion of root pruning or upon completion of the adjacent work provided that adequate safety and warning devices are placed and maintained at each location. The area between the back of curb and the barriers shall be backfilled with Class "C" topsoil conforming to 212-1.

300-13.3 Crown Reduction. Trimming shall be done by the crown reduction method (see Exhibit B). Crown reduction trimming is the size reduction of tops, sides, under branches or individual limbs by trimming back to a strong crotch able to sustain the sap flow of the parent branch.

Crown reduction shall include reduction, shaping, thinning and cleaning of heavy weight as necessary to leave the tree in a balanced, symmetrical-looking condition. Trimming shall be done to bring out or emphasize the natural characteristics of the tree.

Crown reduction shall also include removal of deadwood and weak, split, diseased, insect infested, broken, low or crossing limbs. Branches with extremely narrow angles of attachment shall be removed. Stubs 1 inch in diameter and larger throughout the tree shall be removed. Any structural weaknesses, dead or diseased trees, decayed trunks or branches shall be reported to the Engineer.

Laterals shall be cut to preserve the natural form and shape of the tree. Limbs which extend beyond the natural perimeter or where such overburden appears likely to cause breakage of the limb shall be shortened. The crown shall form a symmetrical shape with the weight evenly distributed when trimming is completed.

Foreign vegetation, vines entwined in trees, and all vines and sucker growth on tree trunks shall be removed. Vine tendrils shall be removed without injury to trees and cleared at least 18 inches from the base of the trees.

The work shall also include trimming to provide adequate clearance for moving vehicles within the traveled roadway, for pedestrians on sidewalks, and for structures with their connecting utility lines. Final minimum clearance under trees shall be as shown on Exhibit C. When trimming the bottom branches, care shall be taken to obtain a balanced appearance when viewed from the opposite side of the street immediately opposite the tree.

Limbs 2 inches in diameter or over shall be pre-cut to prevent splitting. When there is a chance of bark tearing below the crotch, large limbs shall be removed with three cuts (see Exhibit A). The first cut "(A)" shall be made on the underside of the branch 1 to 2 feet from the crotch. The undercut shall be at least 1/3 of the diameter. The second cut "(B)" shall be made on the upper side of the branch a distance equal to the diameter of the limb further from the crotch than the first. The final cut "(C)" shall be made at the crotch in a manner to favor the earliest possible covering of the wound by callus growth. Cuts shall not be made so large that they will prevent sap flow. This requires that the cut be as small as practical, be reasonably flush within the shoulder or sap ring area, and that the cambium tissues at the edge of the cut be alive and healthy. Flush cuts which produce large wounds and weaken the tree at the cut shall not be made.

On all trees known or suspected to be diseased, pruning tools as well as cut surfaces shall be disinfected with a 20 percent chlorine bleach solution or 70 percent methyl alcohol solution after each cut and between trees where there is danger of transmitting the disease on tools or as directed by the Engineer. Fresh solution shall be mixed daily.

Trees shall be trimmed to clear all adjacent structures by a minimum of 4 feet. Trimming of the trees shall provide adequate clearance for any obstructed street light standards, mast arms or globes.

Branches shall be cut back to a lateral branch not less than 1/3 of the diameter of the branch being removed. Wounds made by splitting limbs shall be cleaned of torn and broken wood fibers and bark traces to ensure proper healing. Unbroken branches shall be headed back to balance cuts made on broken branches particularly to reduce exposure to future high winds.

As part of crown reduction trimming, trees over 45 feet shall be reduced in height approximately 33 percent. Trees less than 45 feet tall may be reduced in height; however, this height reduction shall not exceed 33 percent. Height reduction shall not be performed when this treatment is incompatible with the species.

300-13.4 Cleanup. Debris generated by root pruning and trimming operations shall be removed from the Project site at the end of each working day and properly disposed of outside the right-of-way.

The Contractor shall clean the Project site daily when work is completed, including the raking of leaves, twigs, chips, etc., from lawns and parkways and the sweeping of streets. However, fireplace size logs may be left on parkway areas for pickup by adjacent property owners for a period of up to 4 Days following tree trimming or removal. All wood shall be removed from the Project site within 5 Days of the trimming or removal.

300-13.5 Payment. The Contract Unit Price for "ROOT PRUNE TREE INCLUDING ROOT CONTROL BARRIER" shall be considered as including excavation, root pruning, furnishing and installing root sealer fabric and root control barriers, backfilling, cleanup, and all other appurtenant work.

The Contract Unit Price for "CROWN REDUCTION, TREE" for the various diameter sizes shall be considered as including all work required for conformance to the requirements specified in 300-13.3 and 300-13.4.

[Include the following if the Engineer's Estimate includes an item for "Shoulder Grading" and the Plans show grading along roadway shoulders after resurfacing:]

Add the following subsection:

300-14 SHOULDER GRADING.

- **300-14.1 General.** Shoulder grading shall consist of grading existing shoulder material to the dimensions shown on the Plans or as directed by the Engineer.
- **300-14.2 Measurement.** Shoulder grading will be measured by the miles of shoulder graded on each side of the roadway regardless of width.
- **300-14.3 Payment.** Payment for shoulder grading will be made at the Contract Unit Price for "SHOULDER GRADING".

[End inclusion.]

SECTION 301 - TREATED SOIL, SUBGRADE PREPARATION, AND PLACEMENT OF BASE MATERIALS

301-1 SUBGRADE PREPARATION.

[Include 301-1.1 if the Plans show "dig-outs" or new AC pavement to be constructed on existing subgrade material:]

301-1.1 General. Add the following:

This subsection shall also govern the preparation of subgrade material prior to the placement of the new asphalt concrete pavement. The Plans show areas in which the existing asphalt concrete pavement is to be removed and replaced with new asphalt concrete pavement ("dig-outs").

After removal of the existing asphalt concrete pavement, the subgrade shall be graded and compacted to accommodate the new asphalt concrete pavement. Additional subgrade material shall be placed, or excess subgrade material removed, as necessary, to achieve the subgrade tolerance specified in 301-1.4.

[Include 301-1.2 if AC pavement is to be placed on native soil. Do not include for "digouts."]

301-1.2 Preparation of Subgrade. Add the following:

Where asphalt concrete pavement is required to be placed directly on native soil, the soil shall first be sterilized. All growth shall be removed from said area by scalping the surface and plowing or disc harrowing. The area shall then be shaped and recompacted, and the subgrade prepared for the pavement.

A nonselective, pre-emergent herbicide shall be used. Dry powder or crystal applications will not be allowed. The herbicide shall be a commercial product which has been registered and approved for its intended use by the Environmental Protection Agency. It shall be delivered to the Project site in original unopened containers with labels that clearly indicate instructions as required by law.

Herbicides shall be applied strictly in accordance with the manufacturer's label instructions by a person licensed to apply chemical herbicides. Herbicides shall not be applied within 3 feet of existing planted areas and areas to be planted.

At least 10 Working Days prior to herbicide application, the Contractor shall submit to the Engineer a written program indicating the proposed herbicide, method of application and name of the responsible person who will be performing the application work. The Contractor shall notify the Engineer 24 hours prior to the proposed time of application. Upon completion of the application, the Contractor shall file with the Engineer a certified record of herbicide treatment, including the amount and rate of application, locations, type of herbicide used and the date of application.

[Include the following when QA/QC is required:])

301-1.3 Relative Compaction. Add the following:

The Contractor shall submit a "Quality Control Program for Subgrade Compaction" in accordance with 2-5.3.4. This program shall include the name(s) of personnel responsible for quality control, their qualifications, and specific procedures to be followed during subgrade compaction operations.

The Agency will determine the maximum dry density to be used by the Contractor and the Agency in determining relative compaction prior to the start of compaction operations. The Contractor shall furnish representative samples of subgrade material for the Agency's use. The Agency will determine the maximum dry densities as necessary during the progress of the Work as determined by the Engineer.

The Contractor shall perform compaction tests on subgrade as part of its Quality Control Program. The Contractor shall perform a minimum of 1 compaction test per lift for each **2500** square feet of subgrade unless otherwise directed by the Engineer. The Contractor shall keep accurate records of all compaction tests it performs as part of its Quality Control Program and shall provide a copy of these records to the Engineer at the end of each working day. The Engineer will review these records prior to requesting Quality Assurance testing to be performed by the Agency. **The Contractor shall allow the Agency 48 hours to complete its Quality Assurance Testing.**

[End inclusion.]

301-1.6 Adjustment of Manhole Frame and Cover Sets to Grade. Replace the first 3 sentences of the first paragraph with the following:

Utility manholes, vault frames and covers located within an area to be paved or graded will be adjusted by the owners to finish grade. Other manholes within the area to be paved or graded shall be set to finish grade by the Contractor in accordance with 302-5.8 unless otherwise specified.

Refer to 302-1 for adjustment of manholes within a roadway to receive full-width cold milling.

301-1.7 Payment. Add the following:

[Include the following if the Plans show "dig-outs" to be constructed on existing subgrade material:]

Payment for preparing the subgrade prior to placement of new asphalt concrete pavement shall be considered as included in the Contract Unit Price for "AC PAVEMENT (DIGOUTS)."

[Include the following if the Plans show new AC Pavement to be constructed on existing subgrade material:]

Payment for preparing the subgrade prior to placement of new asphalt concrete pavement shall be considered as included in the Contract Unit Price for "AC PAVEMENT."

[Include the following two paragraphs when QA/QC is required:]

Replace the first sentence with the following:

Payment for preparing the subgrade, including preparation and implementation of a Quality Control Program and performance of compaction testing, will be considered as included in the Contract Unit Price for the item of work for which the subgrade is prepared. Any necessary re-testing shall be at the Contractor's expense.

[Include the following paragraph(s) as appropriate if the quoted items are included in the Engineer's Estimate or referenced on the Plans:]

Replace the third and fourth paragraphs with the following:

Payment for adjusting a manhole frame and cover to grade, where the difference between the existing and final elevation of the top of the frame is less than 1 foot or where the adjusting is accomplished by adjustment rings only, will be made at the Contract Unit Price for "ADJUST MANHOLE".

Payment for adjusting a manhole frame and cover to grade, where the difference between the existing and final elevation of the top of the frame is 1 foot or more or where the work involves removal of the eccentric concrete cone, will be made at the Contract Unit Price for "RECONSTRUCT MANHOLE."

[Include the following if CSD manholes are present on the Work site:]

Payment for performing work adjacent to or to expedite adjustment of County Sanitation Districts' manholes shall be considered as included in the prices in the Bid for the various related items of work.

301-2 UNTREATED BASE.

[Include the following if the Plans show "digouts" or new AC pavement to be constructed on existing base material:]

301-2.1 General. Add the following:

This subsection shall also govern the preparation of existing base material prior to the placement of the new asphalt concrete pavement. The Plans show areas in which the existing asphalt concrete pavement and a portion of the existing base material is to be removed and replaced with new asphalt concrete pavement.

After removal to the depth shown on the Plans, the existing base material shall be graded and compacted to accommodate the new asphalt concrete pavement. Additional base material shall be placed, or excess base material removed, as necessary, to achieve the tolerance specified in 301-2.3.

[Include the following when QA/QC is required:]

301-2.3 Compacting. Add the following:

The Contractor shall submit a "Quality Control Program for Untreated Base Compaction" in accordance with 2-5.3.4 of Section G. This program shall include the name(s) of personnel responsible for quality control, their qualifications, and specific procedures to be followed during untreated base compaction operations.

The Agency will determine the maximum dry density to be used by the Contractor and the Agency in determining relative compaction prior to the start of compaction operations. The Contractor shall furnish representative untreated base samples for the Agency's use. The Agency will determine the maximum dry densities as necessary during the progress of the Work as determined by the Engineer.

The Contractor shall perform compaction tests on untreated base as part of its Quality Control Program. The Contractor shall perform a minimum of 1 compaction test per lift for each 100 cubic yards of untreated base placed unless otherwise directed by the Engineer. The Contractor shall keep accurate records of all compaction tests it performs as part of its Quality Control Program and shall provide a copy of these records to the Engineer at the end of each Working Day. The Engineer will review these records prior to requesting Quality Assurance testing to be performed by the Agency.

[End inclusion.]

301-2.4 Measurement and Payment. Add the following:

[Include the following if the Plans show "digouts" to be constructed on existing base material:]

Payment for preparation of existing base material prior to placement of new asphalt concrete pavement shall be considered as included in the Contract Unit Price for "AC PAVEMENT (DIGOUTS)."

[Include the following if the Plans show new AC Pavement to be constructed on existing base material:]

Payment for preparation of existing base material prior to placement of new asphalt concrete pavement shall be considered as included in the Contract Unit Price for "AC PAVEMENT."

[Include the following if the quoted items are included in the Engineer's Estimate:]

Payment for crushed aggregate base will be made at the Contract Unit Price for "CRUSHED AGGREGATE BASE."

Payment for crushed miscellaneous base will be made at the Contract Unit Price for "CRUSHED MISCELLANEOUS BASE."

Payment for pulverized miscellaneous base will be made at the Contract Unit Price for "PULVERIZED MISCELLANEOUS BASE." The Contract Unit Price shall be considered as including pulverizing, additional aggregate, spreading, and compaction. Payment for removal and disposal of excess pulverized material off the Work site will be made at the Contract Unit Price for "UNCLASSIFIED EXCAVATION."

[Include the following when QA/QC is required:]

Payment for preparation and implementation of a Quality Control Program, including performance of compaction testing, will be considered as included in the Contract Unit Price for the base material Bid item(s).

[End inclusion.]

[Include the following if CSPB is shown on the Plans. Ensure Bid items for "CSPB (each thickness)", "Portland Cement for CSPB," and "Prime/Tack Coat" are included in the Engineer's Estimate:]

- 301-3 PORTLAND CEMENT TREATED MATERIALS.
- 301-3.4 Cement Stabilized Pulverized Base (CSPB).
- **301-3.4.2 Materials.** Add the following:
- **301-3.4.2.5 Prime/Tack Coat.** Prime/tack coat material shall be one of the following:
- a) "ePrime" as manufactured and distributed by Ergon Asphalt and Emulsions. For further information, contact Mr. Tom Hicks, (909) 829-0505.
- b) Agency-approved equal. An emulsion or modified emulsion not specifically formulated a) to break in 45 minutes or less, and b) for use in prime coat applications will not be considered as an "equal."

[Include the following if the Contractor is required to prepare the mix design.]

301-3.4.3 Mix Design. Replace the last paragraph with the following:

The Contractor shall submit a mix design in accordance with 2-5.3 and 6-1.2. The mix design shall be prepared by a testing laboratory approved by the Engineer and signed and stamped by a State of California Registered Civil Engineer. The mix design shall be prepared using the mixture of pulverized asphalt concrete pavement, base material, subgrade soil and Portland cement (from the proposed supplier) to be stabilized.

[End Inclusion.]

301-3.4.5 Sequence of Work. Add the following:

- i) Maintain the CSPB surface.
- j) Prior to application of the prime/tack coat, moisten the CSPB surface.
- k) Apply prime/tack coat material 45 minutes to 1 hour prior to placement of the overlying pavement.
- **301-3.4.15 Fog Seal.** Replace the entire subsection with the following:
- 301-3.4.15 Maintenance and Prime/Tack Coat.
- **301-3.4.15.1 Maintenance.** After final curing, the Contractor shall apply water to the CSPB surface at a rate and frequency which prevents visible dust until the base course of asphalt concrete is placed. The Contractor shall perform additional watering as directed by the Engineer.

301-3.4.15.2 Prime/Tack Coat. Prior to placement of the asphalt concrete base course, the Contractor shall apply prime/tack coat material to the CSPB surface. Immediately prior to application, the CSPB shall be watered at a rate that will result in the surface being saturated, but which does not result in ponded water.

The rate of application of ePrime shall be 0.15 to 0.25 gallons per square yard. The rate of other approved prime/tack coat materials and CSPB surfaces which have been previously fog sealed shall be as directed by the Engineer.

The prime/tack coat material shall be applied a minimum of 45 minutes prior to the start of paving in order to allow the material to break. After application, traffic shall not be allowed to drive over the CSPB surface.

301-3.4.16 Measurement. Add the following:

Prime/tack coat material will be measured by the gallon.

301-3.4.17 Payment. Add the following:

Payment for Portland cement will be made at the Contract Unit Price per ton for "PORTLAND CEMENT FOR CSPB."

Payment for CSPB will be made at the Contract Unit Price per square yard for "CEMENT STABILIZED PULVERIZED BASE."

Payment for prime/tack coat will be made at the Contract Unit Price per gallon for "PRIME/TACK COAT." The Contract Unit Price shall include furnishing and application. No payment will be made for material applied in which the percentage of solids by volume was less than 35 percent.

[End inclusion.]

[Include the following if LSPB is shown on the Plans. Ensure Bid items for "LSPB (each thickness)", "Quicklime for LSPB," and "Prime/Tack Coat" are included in the Engineer's Estimate.]

Add the following subsection:

301-6 LIME STABLIZED PULVERIZED BASE (LSPB).

301-6.1 General. LSPB shall consist of pulverized asphalt concrete pavement, base material, sub-grade soil, lime, and water uniformly mixed, compacted, finished and cured in such a manner that the in-place mixture forms a dense, uniform mass conforming to the lines, grades, and cross sections shown on the Plans.

301-6.2 Materials.

301-6.2.1 Lime. Lime shall be quicklime conforming to the chemical requirements in ASTM C977 except it shall have a minimum of 90 percent available calcium oxide. Quicklime shall be supplied from a single source. Hydrated lime (dry or slurry), air slaked, by-product or waste lime will not be permitted. Quicklime shall be protected from moisture until application and be sufficiently dry to flow freely when handled and added.

Quicklime, when delivered to the Work site, shall conform to the following grading requirements when tested in accordance with ASTM C136 (dry sieving only):

Sieve Size	Percentage Passing
3/8 inch	98-100

A Certificate of Compliance conforming to 4-1.5 and a certified weighmaster ticket showing the shipping weight shall be submitted to the Engineer with each delivery.

301-6.2.2 Water. Water shall conform to 201-1.2.3.

301-6.2.3 Pulverized Base Material. Pulverized base material shall conform to 301-3.4.2.3 of the SSPWC.

[Include the following if the Contractor is required to prepare the mix design. Otherwise, include "301-6.2.4 (Not Used)."]

- **301-6.2.4 Mix Design.** The Contractor shall submit a mix design in accordance with 2-5.3 and 6-1.2. The mix design shall be prepared by a testing laboratory and signed and stamped by a State of California Registered Civil Engineer. The mix design shall be determined using the mixture of pulverized asphalt concrete pavement, base material, sub-grade soil and lime (from the proposed supplier) to be stabilized and shall determine the following:
 - a) Rate of quicklime application to the pulverized, blended mixture.
 - b) Optimum water content during mixing, curing and compaction.
 - c) Additional mixing or equipment requirements, if any.
 - d) Mellowing time requirement if different than specified in 301-6.8.
 - e) Moisture density relationship, in accordance with ASTM D1557, of untreated and treated pulverized, blended material.

The mix design shall conform to the following requirements:

f) pH: Minimum 12.4 after compaction of initial mixing with the lime at ambient temperature, in accordance with Eades-Grimm pH test method (ASTM C977 APPENDIX).

- g) Plasticity Index: Less than 10 when tested in accordance with AASHTO T89 and T90.
- h) Swell Potential: One (1) percent or less vertical expansion of an air dried soil when inundated with water and allowed to swell at a confined pressure of 60 psi when tested in accordance with ASTM D4829-25.
- i) Unconfined Compressive Strength: Minimum 160 psi in 5 Days curing at 100°F when tested in accordance with ASTM D1633 Method A.

[End inclusion.]

- **301-6.3 Equipment.** Equipment shall conform to 301-3.4.4 of the SSPWC.
- **301-6.4 Sequence of Work.** The general sequence of work for production of lime stabilized pulverized base shall be as follows:
 - a) Pulverize the existing asphalt concrete pavement and mix with the underlying base material and sub-grade soil to the depth shown on the Plans. The resultant material shall hereinafter be referred to as "pulverized base material."
 - b) Request and receive Agency determination of the maximum density.
 - c) Place the pulverized base material to the lines, grades, and cross sections shown on the Plans. Remove and dispose of the excess material.
 - d) Uniformly spread and mix quicklime into the pulverized base material to the depth shown on the Plans.
 - e) Allow the pulverized base material-quicklime mixture to mellow in an uncompacted state for the time specified in 301-6.8. Maintain the mixture as necessary to allow vehicular access.
 - f) Re-mix the pulverized base material-quicklime mixture.
 - g) Compact the pulverized base material-quicklime mixture.
 - h) Place the pulverized base material-quicklime mixture to the lines, grades, and depths shown on the Plans.
 - i) Cure.
- **301-6.5 Pulverizing.** The existing asphalt concrete pavement shall be pulverized in one pass and mixed with the underlying base material and sub-grade soil to the depth shown on the Plans in subsequent passes until a uniformly blended material conforming to 301-6.2.3 is produced.

Upon the completion of pulverizing, the Agency will determine the maximum dry density of the pulverized base material in accordance with ASTM D1557. A maximum dry density will be determined for each 1,000 feet of roadway pulverized. This density shall be used, in conjunction with the specified spread rate, to determine the weight of quicklime to be spread. *The Contractor shall allow 2 Working Days for the Agency to provide the test results.*

301-6.6 Initial Grading. Following the completion of pulverizing, pulverized base material shall be placed to the lines, grades and cross sections shown on the Plans.

Temporary access ramps shall be constructed at each driveway following the completion of placement or at the end of each Working Day, whichever comes first.

Excess pulverized base material shall be removed and disposed of off the Work site.

301-6.7 Quicklime Spreading and Initial Mixing. Quicklime shall be spread by a spreader truck conforming to 301-6.3. Quicklime shall be in a dry state at the time of spreading. Quicklime shall not be spread while the atmospheric temperature is below 35°F or wind conditions are such that blowing lime will have an adverse effect on traffic or adjacent property. No traffic other than the reclaimer or other related construction equipment shall be allowed to pass over the spread quicklime until after the completion of the initial mixing.

Quicklime shall be uniformly spread on the pulverized base material at the rate (percent by weight of the pulverized base material) specified in the approved mix design unless otherwise approved by the Engineer. *The quantity in the Bid has been calculated on the basis of a rate of 5 percent.* The quicklime spread rate shall not be less than or greater than 0.5 percentage points from the specified rate. The Contractor shall demonstrate the consistency of the spread rate by conducting a pan test. Quicklime that becomes displaced before mixing begins shall be replaced.

After spreading has been completed, the quicklime shall be mixed with the pulverized base material to the depth below the bottom of the asphalt concrete pavement to be constructed shown on the Plans. Mixing shall be performed a minimum of 2 times. At least one of the 2 mixing operations shall be performed while introducing water into the pulverized base material-quicklime mixture through operation of the metering/pump device on the reclaimer. Water shall be added as necessary to provide a moisture content of at least 3 percent above the optimum moisture content of the pulverized base material-quicklime mixture.

Any remaining untreated pulverized base material around or attached to manholes, valves, vaults, survey monuments or other structures; adjacent or attached to curbs and gutters; or in areas inaccessible by the reclaimer shall be removed to the depth mixed, and replaced with the pulverized base material-quicklime mixture.

301-6.8 Mellowing and Final Mixing. The pulverized base material-quicklime mixture shall be allowed to cure or "mellow" in an un-compacted state for a period of no less than 16 hours unless otherwise specified in the approved mix design or approved by the Engineer. During the mellowing periods, the moisture content of the mixture shall be maintained above the optimum moisture content. In no case shall initial and final mixing be performed on the same day.

After the required mellowing period and prior to compaction, the pulverized base material-quicklime mixture shall be re-mixed. Mixing operations shall be performed in such a manner as to produce a uniformly blended mixture of quicklime, water, and pulverized base material free of streaks and pockets of quicklime.

Subsequent to the addition of water, sufficient passes of the reclaimer shall be made as necessary to produce a uniformly treated material. Uniformity will be determined initially by sampling and testing at variable depths and locations within the mixture. The number of passes required may be adjusted based upon subsequent sampling and testing.

The depth of mixing shall not vary more than 0.1 foot from the specified depth at any point. Mixing to a depth that exceeds the specified depth by 10 percent or more shall be considered as evidence of an inadequate amount of lime and additional lime shall be added at the Contractor's expense.

No color reaction of the treated material, exclusive of 1 inch or larger clods, when tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.

Final mixing shall continue until the pulverized base material-quicklime mixture, exclusive of rock or aggregate, conforms to the following gradation when tested in accordance with ASTM C136:

Sieve Size	Percentage Passing
1 inch	98 min.
No. 4	65 min.

Temporary access ramps shall be constructed at each driveway after the completion of final mixing, or the end of each working day, whichever comes first.

301-6.9 Compaction. LSPB material shall be compacted to not less than 95 percent relative density when tested in accordance with ASTM D1557.

Immediately following the completion of final mixing operations, compaction operations shall begin. The moisture content of the mixture at the start of compaction operations shall not be below the optimum moisture content.

The number and weight of rollers shall be capable of compacting the material to the required density. Areas inaccessible to rollers shall be compacted to the required density by other equipment approved by the Engineer.

Initial compaction shall be performed using pad foot or segmented wheel rollers. Final compaction shall immediately follow initial compaction. Final compaction shall be performed using steel drum or pneumatic-tired rollers. The use of vibratory rollers will not be permitted.

Compaction shall be completed within 36 hours of the completion of final mixing operations.

301-6.10 Final Grading. LSPB material shall be placed to the lines, grades, and cross sections shown on the Plans. Compaction and final placement shall be performed in such a manner as to produce a smooth, dense surface free of compaction planes, cracks, ridges or loose materials.

The finished surface of the material shall be hereinafter referred to as "the grading plane." At any point along the grading plane, the elevation shall not vary more than 0.02 feet above or below the required elevation.

If, after compaction, any point along the grading plane is above the specified grade tolerance, excess material shall be trimmed, removed, and disposed of as necessary to bring within tolerance. No loose material shall be left on the grading plane. Trimmed surfaces shall be completely rolled using steel drum or pneumatic tire rollers. Trimming of excess material shall not be conducted unless rolling can be completed within 2 hours after trimming.

New or trimmed material shall not be added to any point or area along the grading plane below the specified tolerance or to raise the elevation of compacted material.

Points or areas along the grading place below the specified tolerance, irregularities, or weak spots that develop shall be corrected immediately by scarifying the area affected, adding or removing material as required, re-compacting, and re-placing. At the end of each working day, a vertical-faced construction joint shall be made in the compacted material normal to the centerline of the roadway. Additional material shall not be placed until the construction joint has been approved by the Engineer.

If pumping sub-grade should become evident at any time prior to paving, the Engineer may require proof-rolling with a pneumatic tire roller or other approved equipment in order to identify the limits of the unacceptable area.

The finished surface shall be maintained in a smooth condition, free from undulations and ruts, until the base course of asphalt concrete pavement is constructed.

301-6.11 Curing. The finished surface of LSPB shall be kept moist for a minimum of 72 hours from the completion of final placement operations or until placement of the base course of asphalt concrete pavement, whichever comes first. Water shall be applied as necessary to maintain the required moisture content.

301-6.12 Maintenance and Prime/Tack Coat.

301-6.12.1 Maintenance. After curing, the Contractor shall regularly sweep the LSPB surface to remove accumulated fines, and apply water to the LSPB surface at a rate and frequency which prevents visible dust until the base course of asphalt concrete pavement is placed. The Contractor shall perform additional sweeping and watering as directed by the Engineer.

If the finished surface is to be exposed for greater than 72 hours, a fog seal of CSS-1h emulsified asphalt conforming to 203-3 shall be applied at a rate of 0.10 to 0.20 gallons per square yard. The final application rate shall be approved by the Engineer. The fog seal shall be maintained and repaired as necessary until placement of the base course of asphalt concrete pavement. The application of a fog seal shall not relieve the Contractor of the aforementioned sweeping and watering requirements.

301-6.12.2 Prime/Tack Coat. Prior to placement of the asphalt concrete base course, the Contractor shall apply prime/tack coat material to the LSPB surface. Immediately prior to application, the LSPB shall be watered at a rate that will result in the surface being saturated, but which does not result in ponded water.

The rate of application of ePrime shall be 0.15 to 0.25 gallons per square yard. The rate of other approved prime/tack coat materials and LSPB surfaces which have been previously fog sealed shall be as directed by the Engineer.

The prime/tack coat material shall be applied a minimum of 45 minutes prior to the start of paving in order to allow the material to break. After application, traffic shall not be allowed to drive over the LSPB surface.

Application of a fog seal immediately after final curing shall not relieve the Contractor of the requirement to apply a prime/tack coat.

301-6.13 Measurement. LSPB will be measured by the square foot of finished surface, complete and in-place.

Quicklime will be measured by the ton. The basis of payment shall be the net weight of quicklime used to produce lime stabilized pulverized base. The Contractor shall furnish the Engineer with certified weighmaster certificates showing the weight of each load delivered to the Work site and the weight remaining on the Work site after completion. Payment will be made for the difference between the weight delivered to the Work site and the weight of quicklime remaining on the Work site.

Prime/tack coat material will be measured by the gallon.

Excess pulverized base material, excess lime stabilized pulverized base material, and unsuitable material will be measured by the cubic yard based on the dimensions shown on the Plans.

301-6.14 Payment. Payment for LSPB will be made at the Contract Unit Price per square yard for "LIME STABILIZED PULVERIZED BASE." The Contract Unit Price shall include pulverizing, mixing, and water; mellowing; compaction; placement to the lines, grades and cross sections shown on the Plans; curing; and maintenance of the completed work.

Payment for quicklime will be made at the Contract Unit Price per ton for "QUICKLIME FOR LSPB." The Contract Unit Price shall include furnishing and spreading quicklime. Payment for quicklime will not be subject to the provisions of 3-2.2.2 and 3-2.2.3.

Payment for prime/tack coat will be made at the Contract Unit Price per gallon for "PRIME/TACK COAT." The Contract Unit Price shall include furnishing and application. No payment will be made for material applied in which the percentage of solids by volume was less than 45 percent.

Payment for removal and disposal of excess pulverized base material, excess LSPB material, and unsuitable material will be made at the Contract Unit Price per cubic yard for "UNCLASSIFIED EXCAVATION."

[End inclusion.]

[Include the following if PBM is shown on the Plans (other than as part of CSPB/LSPB). Ensure "Pulverized Base Material" is included as a Bid item.]

Add the following subsection:

301-7 PULVERIZED BASE MATERIAL (PBM).

- **301-7.1 General.** PBM shall consist of existing or remaining asphalt concrete pavement, base material, and subgrade soil pulverized and mixed by a reclaimer conforming to 301-3.4.4.2.
- **301-7.2 Requirements.** The resultant pulverized base material shall conform to the following requirements when tested in accordance with ASTM C136:
 - a) 100 percent shall pass the 3-inch (75 mm) sieve.
 - b) 95-100 percent shall pass the 2-inch (50 mm) sieve.
 - c) Not less than 90 percent shall pass the 1-1/2 inch (37.5 mm) sieve.
 - d) 35 to 60 percent shall pass the No. 4 (4.75 mm) sieve.
 - e) The material shall be uniformly graded.
- **301-7.3 Spreading.** Spreading shall conform to 301-2.2 except PBM shall be spread and compacted in one or more layers. The maximum compacted layer shall not exceed 8 inches.
 - **301-7.4 Compaction.** Compaction shall conform to 301-2.3.
- **301-7.5 Measurement.** PBM will be measured by the square yard for each thickness shown on the Plans.
- **301-7.6 Payment.** Payment for PBM will be made at the Contract Unit Price per square yard for each thickness shown on the Plans. The Contract Unit Price shall include pulverizing, spreading, and compaction.

SECTION 302 - ROADWAY SURFACING

(Include 302-1 if the Work includes full-width cold milling:)

302-1 COLD MILLING OF EXISTING PAVEMENT.

302-1.1 General. Add the following:

Full-width cold milling shall only be performed during days with a 48-hour clear weather forecast.

Prior to cold milling the full width of a roadway, any affected storm drain or sewer manholes (other than County Sanitation Districts' manholes) shall be lowered below the proposed cold milling depth to facilitate cold milling. Refer to 5-4 of Section G for the procedure to be followed by the Contractor for the adjustment of County Sanitation Districts' Manholes. After cold milling and resurfacing have been completed, the affected manholes shall be adjusted to the finished grade in accordance with 302-5.8.

302-1.9 Traffic Signal Loop Detectors. Replace the entire subsection with the following:

The Contractor shall notify the Engineer a minimum of 3 Working Days prior to the start of cold milling asphalt concrete pavement on any street containing traffic signal loop detectors. Upon notification, the Contractor shall allow the Agency 2 Working Days to mark the location of all existing loop detectors and place the affected traffic signals on fixed timing.

The Contractor shall schedule loop detector replacement work to begin immediately following the completion of paving operations.

302-1.12 Payment. Add the following:

Payment for cold milling asphalt concrete pavement will be made at the Contract Unit Price for "COLD MILL AC PAVEMENT."

Payment for adjusting each manhole twice will be made at the Contract Unit Price for "DOUBLE ADJUST MANHOLE."

302-4 SLURRY SEAL SURFACING.

302-4.3 Continuous-Flow Mixers.

302-4.3.1 General. Add the following:

Prior to the beginning of slurry seal surfacing operations, the Contractor shall furnish current licensed weighmaster's certificates indicating the net weight capacity of the aggregate bin of each mixer. Except for partial loads to complete a day's schedule, or for patching, each mixer shall be filled to its rated capacity and the Engineer and the

Contractor shall each keep a daily count of the number of loads and/or partial loads applied to the surface of the existing pavement by each mixer. Each aggregate bin shall have permanent calibration marks in maximum increments of 2 tons.

302-4.3.4 Calibration.

302-4.3.4.1 General. Add the following:

The calibration report shall be submitted in accordance with 2-5.3.4 and 6-1.2 of Section G.

302-4.5 Scheduling, Public Convenience and Traffic Control. Add the following:

"No parking" signs will be furnished by the Agency. The Contractor shall only post those furnished by the Agency unless otherwise approved or directed by the Engineer.

302-4.6 Emulsion-Aggregate Slurry (EAS).

302-4.6.4 Aggregate Application Rate.

302-4.6.4.1 General. Add the following:

Type I aggregate shall be applied at a rate of 9 pounds per square yard and Type II aggregate shall be applied at a rate of 13 pounds per square yard unless otherwise specified on the Plans or directed by the Engineer. When placed over a chip seal or ARAM, Type II aggregate shall be applied at a rate of 19 pounds per square yard unless otherwise directed by the Engineer.

302-4.8 Spreading and Application. Add the following:

The Contractor will be required to work around all existing utility facilities and to seal up to the edges of said facilities. During sealing operations, the Contractor shall cooperate with utility owners having surface facilities and shall cover and completely protect said facilities with roofing paper, polyethylene, or other suitable material. Raised pavement markers shall be removed or covered and completely protected as directed by the Engineer. The Contractor shall exercise care to prevent slurry seal surfacing from being deposited on concrete surfaces and shall remove slurry seal surfacing from surfaces not designated to be sealed. Covering of slurry seal surfacing on concrete surfaces with sand, cement, or paint will not be acceptable.

302-4.9 Field Sampling and Testing.

302-4.9.1 Field Sampling. Add the following after the first paragraph:

In addition to the requirements in the paragraph above, the Agency will perform the Wet Track Abrasion Test, ASTM D3910 modified per 203-5.2, on field samples it obtains each day, the results of which will be used for administration of the provisions of 302-4.11.1. The Contractor may perform "referee" sampling on its behalf. Each referee sample shall be taken immediately before, during or after the sampling by the Agency.

No changes in machine calibration will be allowed between sampling. The Agency will observe the referee sampling to insure compliance with specified procedures. The Agency shall be given the opportunity to observe the remaining portions of the WTAT to assure the accuracy of the referee test. The Contractor shall notify the Engineer at least 24 hours in advance of actual test performance. The referee WTAT shall be performed by an independent, certified laboratory. The results of each referee test will be compared to the respective test performed by the Agency. At the discretion of the Engineer, the referee test may be used as a basis to modify the result of the respective test performed by the Agency.

[Include the following if the Engineer's Estimate includes an item(s) for "Emulsion-Aggregate Slurry" and the unit of measure is "ELT." Do not include for "Rubberized Emulsion-Aggregate Slurry."]

302-4.10 Measurement.

302-4.10.1 General. Replace the entire subsection with the following:

The basis of measurement shall be the dry weight of each type of aggregate used in the Work.

The Contractor shall submit to the Engineer, no later than noon of the first working day following the day of delivery, licensed weighmaster certificates showing the weight of each type of aggregate delivered to the Project stockpile site. Only aggregate intended for use on the Work shall be delivered to the Project stockpile site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of each type of aggregate remaining at the Project stockpile site. Payment will be determined by deducting the remaining weight of each type of aggregate from the total weight of each type of aggregate delivered to the Project stockpile site. The Engineer will compare this quantity to the quantity calculated by multiplying the number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will adjust the calculated weight for partial loads and deduct the quantity of each type of aggregate used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight of each type of aggregate used.

The Contractor shall furnish, operate, maintain, and remove portable scales at the stockpile site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

302-4.10.2 Slurry Seal Mixed in Continuous-Flow Mixers. Replace the entire paragraph with the following:

Slurry seal mixed in continuous-flow mixers will be measured by the weight, in tons, of each type of aggregate used in the Work.

302-4.11 Payment.

302-4.11.2 Slurry Seal Mixed in Continuous-Flow Mixers. Replace the first sentence with the following:

Payment for slurry seal mixed in continuous-flow mixers will be made at the Contract Unit Price per Extra Long Ton (ELT) for each type of aggregate used in the Work. An ELT shall be defined as 2000 pounds of dry aggregate plus emulsified asphalt, set control agents, and water.

Add the following as the second paragraph:

No separate payment will be made for portable scales. Payment shall be considered as included in the Contract Unit Price per ELT for emulsion-aggregate slurry seal for each type of aggregate used in the Work.

[End ELT basis of payment inclusion.]

[Include the following if the Work includes Emulsion-Aggregate Slurry Seal and the Engineer's Estimate includes item(s) for different sizes of slurry aggregate and emulsified asphalt. Do not include for "Rubberized Emulsion-Aggregate Slurry."]

302-4.10 Measurement.

302-4.10.1 General. Add the following:

The Contractor shall submit to the Engineer, no later than noon of the first Working Day following the day of delivery, licensed weighmaster certificates showing the weight of polymer modified emulsified asphalt (PME) and each type of aggregate delivered to the Project stockpile/storage site. Only PME and aggregate intended for use on the Work shall be delivered to the Project stockpile/storage site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of PME and each type of aggregate remaining at the Project site. Payment will be determined by deducting the weight of unused PME and each type of unused aggregate from the total weight of each material delivered to the Project stockpile/storage site. The Engineer will compare these quantities to the quantities calculated by multiplying the number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will adjust the calculated weights for partial loads and deduct the quantities of each material used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight.

The Contractor shall furnish, operate, maintain, and remove portable scales at the stockpile site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

302-4.11 Payment.

302-4.11.2 Slurry Seal Mixed in Continuous-Flow Mixers. Add the following:

No separate payment will be made for portable scales. Payment shall be considered as included in the Contract Unit Prices for PME and each type of aggregate.

[Edit the following as appropriate:]

Payment for Type I aggregate will be made at the Contract Unit Price per ton for "TYPE I SLURRY SEAL AGGREGATE."

Payment for Type II aggregate will be made at the Contract Unit Price per ton for "Type II SLURRY SEAL AGGREGATE."

Payment for Type III aggregate will be made at the Contract Unit Price per ton for "Type III SLURRY SEAL AGGREGATE."

[Use the following, except for REAS:]

Payment for polymer modified emulsified asphalt will be made at the Contract Unit Price per ton for "POLYMER MODIFIED EMULSIFIED ASPHALT (PMCQS-1h)."

[End individual tonnage inclusion.]

[Include the following if the Engineer's Estimate includes an item(s) for "Emulsion-Aggregate Slurry" and the unit of measure is tons (combined tonnage of PME and each type of aggregate), "wet ton." Do not include for "Rubberized Emulsion-Aggregate Slurry."]

302-4.10 Measurement.

302-4.10.1 General. Replace the entire subsection with the following:

The basis of measurement shall be the dry weight of each type of aggregate and the tons of polymer modified emulsified asphalt (PME) used in the Work.

The Contractor shall submit to the Engineer, no later than noon of the first working day following the day of delivery, licensed weighmaster certificates showing the weight of each type of aggregate and PME delivered to the Project stockpile site. Only aggregate and PME intended for use on the Work shall be delivered to the Project stockpile site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of each type of aggregate and PME remaining at the Project stockpile site. Payment will be determined by deducting the remaining weight of each type of aggregate and PME from the total weight of each type of aggregate and PME delivered to the Project stockpile site. The Engineer will compare this quantity to the quantity calculated by multiplying the

number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will adjust the calculated weight for partial loads and deduct the quantity of each type of aggregate used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight of each type of aggregate used.

The Contractor shall furnish, operate, maintain, and remove portable scales at the stockpile site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

302-4.10.2 Slurry Seal Mixed in Continuous-Flow Mixers. Replace the entire paragraph with the following:

Emulsion-aggregate slurry seal mixed in continuous-flow mixers will be measured by the total weight, in tons, for each combination of type of aggregate and PME used in the Work.

302-4.11 Payment.

302-4.11.2 Slurry Seal Mixed in Continuous-Flow Mixers. Replace the first sentence with the following:

Payment for slurry seal mixed in continuous-flow mixers will be made at the Contract Unit Price per ton for the total tonnage of each combination of PME and type of aggregate used in the Work.

Add the following as the second paragraph:

No separate payment will be made for portable scales. Payment shall be considered as included in the Contract Unit Price per ton for emulsion-aggregate slurry seal for each type of aggregate used in the Work.

[Edit the following as appropriate:]

Payment for slurry seal which contains PME and Type I aggregate will be made at the Contract Unit Price per ton for "PME-TYPE 1 SLURRY SEAL."

Payment for slurry seal which contains PME and Type II aggregate will be made at the Contract Unit Price per ton for "PME-Type II SLURRY SEAL."

Payment for slurry seal which contains PME and Type III aggregate will be made at the Contract Unit Price per ton for "PME-Type III SLURRY SEAL."

[End "wet ton" inclusion.]

302-5 ASPHALT CONCRETE PAVEMENT.

302-5.1 General. Add the following:

The Contractor shall schedule the paving work such that no longitudinal drop-offs on the pavement will remain overnight in the travelled way. Any transverse drop-offs on the pavement over 1 inch in height that will remain overnight shall be ramped with temporary AC pavement.

[Include the following if the Work includes full-width cold milling and placement of a leveling or surface course of AC directly over the cold milled surface, not on an ARAM:]

Roadways to receive full-width cold milling shall be resurfaced within **24 hours** of cold milling any portion of the Work.

[Include the following if the Work includes full-width cold milling and placement of a leveling or surface course over an ARAM:]

Asphalt concrete pavement shall be placed within **48 hours** after the completion of the asphalt rubber and aggregate membrane (ARAM).

302-5.5 Distribution and Spreading.

[Include the following paragraph if headers are required:]

Add the following to the end of the first paragraph:

Unless otherwise shown on the Plans, redwood headers will not be required adjacent to alley, roadway or shoulder pavement. Redwood headers will be required adjacent to all driveways and other miscellaneous areas of asphalt concrete pavement unless otherwise directed by the Engineer.

[Include the following paragraph for all projects:]

Replace the fourth paragraph with the following:

Asphalt concrete shall not be placed until the atmospheric temperature is a minimum of 55° F and rising, and the surface temperature of the underlying material is a minimum of 55° F. Asphalt concrete shall also not be placed during unsuitable weather.

[Include the following paragraph if fully automatic screeds are not required:]

Add the following after the sixth paragraph:

Fully automatic screeds will not be required on this Project.

[Include the following paragraph if fully automatic screeds are required:]

Add the following after the sixth paragraph:

The spreading and finishing machine shall be equipped with a fully automatic screed control system which shall be in operation at all times during placement of the surface course. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30-feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, and placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material.

[Include the following if pavement edge treatments are shown on the typical sections for unimproved roadway segments:]

Pavement edges along unimproved roadways shall be constructed in accordance with the "Pavement Edge Treatments" detail included herein at the end of this Section R. Pavement edge treatments shall be constructed monolithically with the adjacent lane or shoulder by a paving machine attachment (device) specifically designed and constructed to produce pavement beveled edges.

Shoulders shall be graded as necessary to accommodate the edge treatment. The subgrade upon which the edge treatment is to be placed shall be free of debris and vegetation, and compacted.

The device must be capable of shaping and compacting asphalt concrete to the cross section shown on the detail. Compaction shall be obtained by constraining the asphalt concrete to reduce the cross sectional area by 10 to 15 percent. The device shall be capable of producing a uniform surface texture without tearing, shoving, or gouging, and of transitioning to. The resultant surface texture shall not contain ridges or indentations.

The angle of the slope shall not deviate by more than \pm 5 degrees from the angle shown on the detail when measured from the plane of the adjacent finished pavement surface.

If paving is done in multiple lifts, the safety edge treatment can be placed either with each lift or with the final lift.

Commercially available devices are described under "3.2 Equipment – AC Safety Edge_{SM} Devices" at the following web site:

http://www.fhwa.dot.gov/everydaycounts/technology/safetyedge/designconst/ch3.cfm #s341

[End inclusion.]

302-5.6 Rolling.

302-5.6.2 Density and Smoothness.

Replace "b)" in the third paragraph with the following:

b) California Test Method 308, Method A (modified to use zinc stearate) when slabs or cores are taken for laboratory testing.

302-5.7 Joints. Add the following:

Longitudinal joints shall coincide with traffic lane lines.

302-5.8 Manholes (and Other Structures). Replace the first sentence of the first paragraph with the following:

Sewer structures, except those owned by the County Sanitation Districts of Los Angeles County, and storm drain structures extending 2 inches or more above the new subgrade shall be removed by the Contractor to the new subgrade before paving.

Add the following after the first sentence of the third paragraph:

Manhole frames and covers shall be cleaned prior to placement of the surface course.

Replace the second sentence of the third paragraph with the following:

The Contractor shall fill the remaining 1-1/2 inches (38 mm) with asphalt concrete (D2-PG 64-10).

Add the following:

Survey monument lids shall be adjusted by the Contractor to the new finished surface. Survey monuments will be located and marked by the Agency prior to the start of the Work. During the progress of the Work, cold millings, hot or cold mix asphalt concrete materials, and other debris shall not be deposited in survey monument wells. Each well shall be free of debris prior to adjustment. Should the monument lids be damaged prior to adjustment, the Contractor shall notify the Engineer. The Agency's Survey/Mapping and Property Management Division, Construction Surveys Section, will furnish new lids for the Contractor to install.

302-5.9 Measurement and Payment. Add the following:

[Include the following on all projects:]

No separate or additional payment will be made for the adjustment of survey monument lids. Payment shall be considered as included in the Bid item(s) for asphalt concrete payement.

[End inclusion.]

Payment for resurfacing (constructing) inverted shoulders will be made at the Contract Unit Price for "AC PAVEMENT (INVERTED SHOULDERS)."

Payment for asphalt concrete pavement placed adjacent to curb ramps and cross gutters prior to resurfacing will be made at the Contract Unit Price for "AC PAVEMENT (PATCHBACK)."

Payment for asphalt concrete pavement for a leveling course where shown on the Plans or directed by the Engineer will be made at the Contract Unit Price for "AC PAVEMENT (LEVELING COURSE)."

[Include the following if the Engineer's Estimate includes a Bid Item for "AC PAVEMENT (DETOUR):"]

Payment for detour pavement will be made at the Contract Unit Price for "AC PAVEMENT (DETOUR)". Such payment shall include all work involved in constructing, maintaining, and removing detour pavement, including grading and sub-grade preparation.

[Include the following if the Plans show headers to be constructed:]

Replace the last paragraph with the following:

Payment for furnishing and installing headers, where required, shall be considered as included in the Contract Unit Price for "AC PAVEMENT."

Add the following subsection:

302-5.10 Asphalt Concrete Curb.

302-5.10.1 General. Asphalt concrete curb shall be constructed of D2-PG 70-10 asphalt concrete conforming to 203-6, and shall be placed on new or existing asphalt concrete or Portland cement concrete pavement. The dimensions and configuration shall be as shown on the Plans or Standard Plans.

- **302-5.10.2 Tack Coat.** A tack coat conforming to 302-5.4 shall be applied to the existing pavement prior to placing the curb.
- **302-5.10.3 Measurement and Payment.** Asphalt concrete curb will be measured by the linear foot. Payment for asphalt concrete curb will be made at the Contract Unit Price and shall include payment for tack coat.

[Do <u>not</u> include 302-6 if the PCC Pavement is for bus pads only:]

302-6 PORTLAND CEMENT CONCRETE PAVEMENT.

302-6.1 General. Add the following:

[Include the following if a PPC & JITT are required:]

a) **Pre-Paving Conference.** The Contractor shall schedule a pre-paving conference at a time and place mutually agreed upon with the Engineer.

The conference must be attended by the following:

- I. The Contractor's Representative (Superintendent).
- II. Concrete paving foreman.
- III. Workers, including:
 - A. Placers
 - B. Roller screed operators
 - C. Finishers
 - D. Personnel performing saw cutting

Each attendee must sign-in on a sheet furnished by the Engineer. Only those workers who have attended the meeting may perform work during paving.

The following will be discussed:

- IV. Equipment to be used.
- V. Expected production, including the limits based on the stationing shown on the Plans.
- VI. Sequence and direction of construction.
- VII. Traffic control.
- VIII. Contractor quality control.
- IX. Agency quality assurance testing.
- X. Other topics as determined by the Engineer.
- **b)** Just-In-Time Training (JITT). The Contractor's personnel required to attend the prepaving conference must also complete Just-In-Time-Training (JITT). JITT is a formal training class.

JITT shall be:

- I. At least 4 hours long.
- II. At the Contractor's option, an extension of the pre-paving conference.
- III. Conducted within 5 miles of the Work site.
- IV. Completed within 10 Working Days of the date of the start of concrete paving.
- V. Conducted during normal working hours.

The JITT instructor shall be someone experienced with the specified pavement construction methods, materials, and tests. The instructor shall be neither an employee of the Contractor or any Subcontractor, nor an Agency employee. Upon completion of the JITT, the instructor must issue a certificate of completion to each participant.

The Contractor shall contact the Southwest Concrete Pavement Association, (209) 409-9052, www.swcpa.org, to arrange for the JITT instructor.

The proposed JITT instructor's name, resume (including education and experience), the proposed JITT facility name and location, and 1 copy each of the course syllabus, handouts, and presentation materials shall be submitted in accordance with 2-5.3 after issuance of the Part 1 NTP.

The Engineer may waive JITT for personnel who have completed equivalent training within the preceding 12 months. Certificates of completion for the equivalent training shall be submitted to the Engineer.

[End inclusion.]

302-6.2 Forms and Headers.

302-6.2.1 General. Replace the first sentence with the following:

Forms and headers for PCC pavement shall be metal except for bus pad construction where wood forms may be used.

302-6.2.3 Metal Forms. Add the following as the first sentence:

Metal forms shall be designed specifically for PCC pavement construction.

302-6.3 Placing Concrete.

302-6.3.1 General. Add the following:

Prior to placement against construction joints, curing compound shall be applied and allowed to dry.

[Include the following except for bus pads and isolated slab replacements:]

Add the following subsection:

- **302-6.3.3 Roller Screed.** A self-propelled, ride-on roller screed shall be used to spread and screed concrete during placement. The roller screed shall be equipped with a minimum of 2 roller tubes. The following roller screeds conform to the aforementioned requirements:
 - a) Multiquip Superscreed (WRS-Series Ride-On Roller Screed), www.multipquip.com.
 - b) Allen RS800 Series, www.alleneng.com.

The roller screed shall ride on a chair and rail system. The roller screed shall neither ride directly on the edge of an existing concrete gutter nor on an existing pavement edge.

302-6.4 Finishing.

302-6.4.2 Tamping. Add the following:

If vibrators are used:

- i. High-frequency vibrators shall be used within 15 minutes of depositing concrete to uniformly consolidate the concrete across the paving width.
- ii. The vibration rate shall be a minimum of 3,500 cycles per minute for surface vibrators and 5,000 cycles per minute for internal vibrators.
- iii. The amplitude of vibration must cause perceptible concrete surface movement at least 1 foot from the vibrating element.
- iv. A calibrated tachometer shall be used for measuring the frequency of vibration.
- v. Vibrators shall not rest on side forms or new concrete pavement.
- vi. Power to vibrators must automatically cease when forward or backward motion of the roller screed is stopped.

302-6.4.4 Final Finishing. Replace the entire subsection with the following:

a) After floating has been completed, edges of initial paving widths shall be rounded to a 1/2 inch radius. Transverse construction joints and the edge of longitudinal construction joints adjacent to hardened concrete pavement shall be rounded to a 1/4 inch radius.

[If tining is not required, include the following:]

b) Prior to curing, the pavement surface shall be given an initial and a final texturing. Initial texturing shall be performed with a burlap drag or broom device capable of producing striations parallel with the centerline. Final texturing shall be performed with a broom device.

c) Initial and final texturing shall produce a pavement surface having a minimum coefficient of friction of 0.30 when tested in accordance with California Test 342.

[End "no tining" inclusion.]

[If tining is required, include the following:]

- b) Prior to curing, pavement shall be given an initial and a final texturing. Initial texturing shall be performed with a burlap drag or broom device capable of producing striations parallel with the centerline. Final texturing shall be performed with a self-propelled machine designed specifically for grooving and texturing. The texturing machine shall be equipped with horizontal and vertical controls and a single row of rectangular spring steel tines capable of producing grooves parallel with the centerline. The tines shall be from 3/32 inch to 1/8 inch wide, on 3/4 inch centers.
- c) The texturing machine shall apply constant downward pressure on the pavement surface during final texturing. Grooves shall be 1) constructed across the entire pavement width in a single pass except not within 3 inches of pavement edges, edges of gutters, and longitudinal joints; 2) parallel and aligned with the pavement edge; and 3) from 1/8 to 3/16 inch deep.
 - d) Final texture shall be uniform and smooth.
 - e) Initial and final texturing shall produce a surface having a coefficient of friction not less than 0.30 when tested in accordance with California Test 342.

[End "tining" inclusion.]

[End "roller screed" inclusion.]

[Include the following (and a copy of California Test 526 at the end of Section R) if profilograph testing is required (when the aforementioned roller screed provisions are included). Don't include for bus pads or slab replacements.]

302-6.4.5 Smoothness.

- **302-6.4.5.1 General.** The Contractor shall perform profilograph testing on the final pavement surface within 10 Working Days after paving. Profilograph testing shall only be performed in the presence of the Engineer unless otherwise approved.
- **302-6.4.5.2 Profilograph Testing.** Profilograph testing shall measure the PI_0 using a zero (null) blanking band in accordance with California Test 526, March 2012 (included at the end of this Section R).

A California profilograph shall be used to determine the profile. If the profilograph uses a mechanical recorder, an electronic scanner shall be used to reduce the profilogram. The profilograph operator must be qualified under the Caltrans "Independent Assurance Manual."

Before starting profilograph testing, the profilograph shall be calibrated in the presence of the engineer unless otherwise approved. The Engineer's absence during calibration shall be noted on the profilogram.

 PI_0 values shall be determined for the final pavement surface for each 528-foot section of a traffic lane. Two profiles shall be taken within each traffic lane, 3 feet from and parallel with the edge of each lane. Each section's PI_0 is the average of the PI_0 values for the measurements within that traffic lane. A section that is less than 528 feet long and is the result of an interruption to continuous concrete pavement surface must comply with the PI_0 specifications for a full section. The PI_0 for a partial section shall be adjusted to reflect a full section.

Stationing shall be used to locate vertical deviations greater than 0.3 inch. The profilogram stationing must be the same as the stationing shown on the Plans. The 528-foot segments shall be noted on the profilogram.

The profilogram shall be labeled with:

- a) Project ID No.
- b) Street Name/X-Street Limits
- c) Stationing
- d) Operator's name
- e) Test date
- f) Test number
- g) Traffic direction
- h) Traffic lane (numbered from left to right when facing in the direction of travel)
- i) Test wheel path (left or right when facing in the direction of travel)
- i) Test direction
- k) Paving direction

Profilograms shall be submitted to the Engineer within 5 Working Days of initial profiling and within 2 Working Days of profiling corrected sections.

- **302-6.4.5.3 Requirements.** The final pavement surface shall conform to the following which take precedence over the straightedge tolerances specified in 302-6.4.1:
 - a) For tangents and horizontal curves having a centerline radius of curvature 2,000 feet or more, the PI₀ shall not exceed 2-1/2 inches per 528-foot section.
 - b) For horizontal curves having a centerline radius of curvature from 1,000 to 2,000 feet including concrete pavement within the superelevation transitions of those curves, the PI₀ shall not exceed 5 inches per 528-foot section.
 - c) The surface shall not have individual high points greater than 0.3 inch.

[End "Smoothess" inclusion.]

[Include 302-6.4.5.4 unless "Grind PCC Pavement" is a separate Bid item.]

- **302-6.4.5.4 Grinding.** Grinding shall conform to Section 42, "Grinding" of the Caltrans Standard Specifications, 2010 Edition. Grinding shall be performed as needed to conform to 302-6.4.5.3 and in accordance with the following:
- a) Individual high points in excess of 0.3 inch shall be reduced by grinding until the high points as indicated by reruns of the profilograph do not exceed 0.3 inch.
- b) After grinding has been completed to reduce individual high points in excess of 0.3 inch, additional grinding shall be performed as necessary to reduce the Profile Index to values specified above in any 528-foot section along any line parallel with the pavement edge.
- c) Additional grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within any one ground area. All ground areas shall be neat rectangular areas of uniform surface appearance.
- **302-6.4.5.5 Acceptance.** The Engineer will accept the final pavement surface for smoothness when the final pavement surface conforms to the requirements above and the profilograms have been submitted.

[End inclusion.]

[Include the following except for bus pads:]

302-6.5 Joints.

302-6.5.2 Construction Joints. Replace the entire subsection with the following:

Construction joints are those made by placing fresh concrete against hardened concrete at the locations shown on the Plans. Longitudinal construction joints not shown on the Plans shall coincide with traffic lane lines or be placed in the middle of a traffic lane. Transverse construction joints shall be perpendicular to traffic lane lines.

Construction joints, both longitudinal and transverse, shall be constructed with a keyway and tie-bars, and as shown on Standard Plan 134.

302-6.5.4 Weakened-Plane Joints. Replace the first sentence of the first paragraph with the following:

Weakened-plane joints shall be formed by cutting a groove in the pavement with a power-driven saw. Weakened-plane joints shall be constructed transversely at 15 feet on center and shall be a minimum of 5 feet from any transverse construction joint. Weakened-plane joints shall not deviate by more than 1-1/4 inches from either side of a 12-foot straight line.

Replace the last sentence of the fourth paragraph with the following:

Tie bars shall be placed in the PCC pavement prior to final tamping operations. Said tie bars shall be placed at the last 4 transverse saw cuts at each end of the new construction. Tie bars shall conform to Standard Plan 134.

302-6.6 Curing. Add the following:

When side forms are removed within 72 hours of the start of curing, the concrete pavement edges shall also be cured.

[End inclusion.]

302-6.8 Measurement and Payment. Add the following:

Payment for PCC pavement will be made at the Contract Unit Price per cubic yard for "PCC PAVEMENT."

No separate or additional payment will be made for grinding necessary to achieve the specified smoothness requirements.

Payment for JITT will be made on the basis of Extra Work except no markup will be allowed. Payment for the instructor, including travel and per diem expenses, and for the labor cost of the Contractor's attendees other than the Contractor's Representative (Superintendent) shall be split equally between the Contractor and the Agency.

[Include 302-9 if the Total Contract Estimate includes a Bid item for Asphalt Rubber Hot Mix]

302-9 ASPHALT RUBBER HOT MIX (ARHM).

302-9.1 General. Replace the entire subsection with the following:

ARHM shall conform to 203-11. Unless otherwise shown on the Plans, ARHM shall be Class ARHM-GG-C.

The Contractor shall schedule the paving work such that no longitudinal drop-offs on the pavement will remain overnight in the travelled way. Any transverse drop-offs on the pavement over 1 inch in height that will remain overnight shall be ramped with temporary AC pavement.

[Include the following if the Work includes full-width cold milling and placement of ARHM directly over the cold milled surface, not on an ARAM:]

Roadways to receive full-width cold milling shall be resurfaced within **24 hours** of cold milling any portion of the Work.

[End inclusion.]

[Include the following if the Work includes placement of ARHM over an ARAM:]

ARHM shall be placed within **48 hours** of the completion of placement of the asphalt rubber and aggregate membrane (ARAM).

[End inclusion.]

[Include the following if ARHM is to be produced using a WMA technology:]

Prior to the start of production and placement of warm mix ARHM, the Contractor (including the Contractor's representative, paving foreman, and paving crew including operators), ARHM producer, Engineer, and other Agency representatives shall be given a minimum 2-hour just-in-time training class by the WMA technology producer. The format of the training shall be lecture and discussion based on a Microsoft Powerpoint presentation. As a minimum, the training shall cover:

- a) Production. The required submittals with the JMF shall be reviewed and discussed. Deviations from the requirements in 203-11 in order to comply with the WMA technology producer's recommendations shall be emphasized.
- b) Placement. The required submittals with the JMF shall be reviewed and discussed. Deviations from the requirements in 302-9 in order to comply with the WMA technology producer's recommendations shall be emphasized.
- c) Quality Assurance/Quality Control.

[End WMA technology inclusion.]

[Include the following for QA/QC projects:]

Add the following:

302-9.1.1 Quality Control Program. The Contractor shall submit a "Quality Control Program for Asphalt Rubber Hot Mix" per 2-5.3.4. This program shall include the name(s) of personnel responsible for quality control, their qualifications, and specific procedures to be followed during asphalt rubber hot mix placement operations.

The Contractor shall maintain accurate records of all tests it performs as part of its Quality Control Program and shall make these records available to the Engineer upon request. The Contractor shall satisfy itself that its materials and workmanship, including those of its subcontractors and suppliers, are in conformance with the Contract Documents. The Contractor shall submit to the Engineer for review copies of the results of all Quality Control tests it has performed prior to requesting the Agency to perform Quality Assurance testing.

[End Inclusion]

[Include the following if a RAC Grant Project:]

Add the following:

302-9.1.2 Recycled Content Certification for the Waste Tire Grant Program. Add the following:

The Contractor shall complete the "Recycled – Content Certification for the Waste Tire Grant Program" for all products purchased and used for this Project that are listed under the product category of this Certification. A copy of this certification is included at the end of this Section R. This certification must be submitted to the Agency within 15 calendar days after field acceptance of the Work.

[End Inclusion]

302-9.3 Distribution and Spreading. Replace the second sentence with the following:

Asphalt rubber hot mix shall not be placed until the atmospheric temperature is a minimum of 55° F and rising, and the surface temperature of the underlying material is a minimum of 55° F, or during unsuitable weather.

Add the following:

The spreading and finishing machine shall be equipped with a fully automatic screed control system which shall be in operation at all times. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30-feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, and be placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material. A joint maker placed on the side of the spreading and finishing machine to ride on the existing or previously constructed surface or mat of material may be required as directed by the Engineer.

[Include the following if pavement edge treatments are shown on the typical sections for unimproved roadway segments:]

Pavement edges along unimproved roadways shall be constructed in accordance with the "Pavement Edge Treatments" detail included herein at the end of this Section R. Pavement edge treatments shall be constructed monolithically with the adjacent lane or shoulder by a paving machine attachment (device) specifically designed and constructed to produce pavement beveled edges.

Shoulders shall be graded as necessary to accommodate the edge treatment. The subgrade upon which the edge treatment is to be placed shall be free of debris and vegetation, and compacted.

The device must be capable of shaping and compacting ARHM to the cross section shown on the detail. Compaction shall be obtained by constraining the asphalt concrete to reduce the cross sectional area by 10 to 15 percent. The device shall be capable of producing a uniform surface texture without tearing, shoving, or gouging, and of transitioning to. The resultant surface texture shall not contain ridges or indentations.

The angle of the slope shall not deviate by more than \pm 5 degrees from the angle shown on the detail when measured from the plane of the adjacent finished pavement surface.

If paving is done in multiple lifts, the safety edge treatment can be placed either with each lift or with the final lift.

Commercially available devices are described under "3.2 Equipment – AC Safety Edge_{SM} Devices" at the following web site:

http://www.fhwa.dot.gov/everydaycounts/technology/safetyedge/designconst/ch3.cfm #s341

[End inclusion.]

[Include the following for QA/QC projects:]

Add the following subsections:

302-9.3.1 Test Strip. The first order of work during distribution and spreading shall be the placement of a test strip. The quantity of the test strip shall be 500 tons. The test strip shall be incorporated into the Work. The test strip shall be located such that it does not have to be opened to traffic immediately upon completion of rolling operations. The Contractor shall not open the test strip to traffic until coring has been completed and the Engineer has so approved.

[Include the following if the Agency will perform the coring:]

302-9.3.2 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 302-9.4. The Contractor shall allow 2 Working Days, beginning the next working day following the day coring operations are completed, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[Include the following if the Contractor will perform the coring:]

302-9.3.2 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 302-9.4. The Contractor shall allow 2 Working Days, beginning on the next working day following the day the cores are furnished to the Engineer, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[End inclusion]

302-9.4 Rolling.

[Include the following if ARHM is to be produced using a WMA technology:]

Add the following:

The temperatures specified herein shall be revised to those approved by the Engineer. The WMA technology producer's recommended temperatures shall be submitted with the job mix formula and shall be subject to approval by the Engineer.

[End WMA technology inclusion]

[Include the following for non-QA/QC projects:]

Replace the third paragraph of 302-5.6.2 of the SSPWC with the following:

b) California Test Method 308, Method A (modified to use zinc stearate) when slabs or cores are taken for laboratory testing.

[Include the following for QA/QC projects:]

Replace the third paragraph of 302-5.6.2 of the SSPWC with the following:

The Contractor shall determine the in-place density and relative compaction of asphalt rubber hot mix placed on this Project as part of its Quality Control Program. The Contractor shall follow the procedures and methods specified in California Test 375, February 2012 (included herein at the end of this Section R) modified as follows:

PART 1. STANDARDIZATION AND CALIBRATION OF THE NUCLEAR DENSITY DEVICE GAGE

1A. APPARATUS

1. Add the following:

The nuclear device shall be specifically designed to determine the density of asphalt concrete.

PART 2. CORRELATION WITH CORE DENSITIES

2A. TEST STRIP

- 1. Add the following:
 - c. The test strip shall conform to 302-9.3. The Contractor shall notify the Engineer 24 hours prior to the placement of the test strip. The Agency's Materials Laboratory will assist the Contractor in determining the Contractor's nuclear gauge correlation value.
- 2. Add the following:

The nuclear density values shall be determined by the Contractor and furnished to the Engineer or Agency representative present during test strip operations.

2B. CORRELATING TO CORES

1. Add the following: [Select one of the following as appropriate:]

The Agency will obtain the cores. The Contractor shall establish the traffic control necessary for the Agency to safely perform the coring operations. Traffic control shall be maintained until the Agency has completed coring operations. Upon the completion of coring operations, the Contractor shall furnish, place, and compact ARHM of the same type and class as the test strip in the core holes.

The Contractor shall core the test strip and furnish the cores to the Engineer. Upon the completion of coring operations, the Contractor shall furnish, place, and compact ARHM of the same type and class as the test strip in the core holes.

4. Replace with the following:

The Agency will determine the density of each core in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate.

5. Add the following:

The Agency will determine the average core density for each test site and furnish to the Contractor within 2 Working Days of receipt of the cores by the Engineer.

6. Add the following:

The Agency will determine the correlation value for each test site and furnish to the Contractor.

PART 3. TEST SITE SELECTION

A. SCOPE

Add the following:

The basis of reporting test results to the Engineer shall be a Lot. A Lot shall be defined as the amount of pavement placed in 1 Day. A Sub-Lot shall be defined as 500 tons. Should the amount of pavement placed in 1 day be less than 500 tons, the Sub-Lot and Lot shall be one and the same. Each Lot shall be from a single source unless otherwise approved by the Engineer.

B. TESTING FREQUENCY

1. Replace with the following:

The Contractor shall test a minimum of 10 sites for each 500 tons of asphalt rubber hot mix placed.

2. Replace with the following:

For areas containing less than 500 tons, the Contractor shall test at the rate of 1 test site for each 50 tons or portion thereof of asphalt rubber hot mix placed.

PART 4. DETERMINING IN-PLACE DENSITY BY THE NUCLEAR DENSITY DEVICE

B. APPARATUS/MATERIAL

1. Add the following:

The nuclear device shall be specifically designed for testing the density of asphalt concrete.

C. DETERMINING IN-PLACE DENSITY

Add the following:

- 13. The Contractor shall furnish the Engineer with a copy of the test results for each Sub-Lot at the end of each Working Day. The test results shall identify the Lot and Sub-Lot in the following manner:
 - 1) Each Lot shall be consecutively numbered (i.e. first day of paving, Lot "1"; second day of paving, Lot "2"; ...)
 - 2) Each Lot shall be divided into Sub-Lots of 500 tons each and shall be consecutively lettered starting with Sub-Lot "A" (i.e. the first Sub-Lot of the first day of paving will be Lot "1-A", the second Sub-Lot of the first day of paving will be Lot "1-B"...the first Sub-Lot of the second day of paving will be Lot "2-A", ...). A Sub-Lot may, when approved by the Engineer, be placed at 2 separate locations as long as placement is in conformance with the Specifications and the Contractor clearly identifies the location and limits of the placement.

PART 5. DETERMINING TEST MAXIMUM DENSITY

A. SCOPE

Add the following:

The Agency will determine the TMD using the laboratory procedure (LTMD). The Agency may, at its option, use the field procedure (FTMD). The Agency will furnish the Contractor with the TMD to be used for the purpose of calculating relative compaction per Part 6.

PART 6. CALCULATING RELATIVE COMPACTION

Add the following:

3. The Agency will take a set of 3 cores per Sub-Lot for the purposes of determining in-place density. In-place density will be determined by the Agency in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate. The average in-place density of the 3 cores will be used for the purpose of calculating relative compaction per Part 6. The Agency, at its option, may determine the average in-place density using a nuclear device in accordance with California Test 375. In the event of a dispute between the results obtained by the Contractor using the nuclear device, and the results obtained by the Agency using California Test 308, the latter results shall prevail.

302-9.5 Joints. Add the following:

Longitudinal joints shall coincide with traffic lane lines unless otherwise approved by the Engineer.

302-9.6 Manholes (and Other Structures). Replace the entire paragraph with the following:

Manhole and other structures shall conform to 302-5.8 of the SSPWC except sewer structures, other those owned by the County Sanitation Districts of Los Angeles County, and storm drain structures extending 2 inches or more above the new subgrade shall be removed by the Contractor to the new subgrade before paving.

Add the following after the first sentence of the third paragraph of 302-5.8 of the SSPWC:

Manhole frames and covers shall be cleaned prior to placement of the surface course.

Replace the second sentence of the third paragraph of 302-5.8 of the SSPWC with the following:

The Contractor shall fill the remaining 1-1/2 inches (38 mm) with asphalt concrete (D2-PG 64-10).

Add the following:

Survey monument lids shall be adjusted by the Contractor to the new finished surface. Survey monuments will be located and marked by the Agency prior to the start of the Work. During the progress of the Work, cold millings, hot or cold mix asphalt concrete materials, and other debris shall not be deposited in survey monument wells. Each well shall be free of debris prior to adjustment. Should the monument lids be damaged prior to adjustment, the Contractor shall notify the Engineer. The Agency's Survey/Mapping and Property Management Division, Construction Surveys Section, will furnish new lids for the Contractor to install.

302-9.9 Payment. Add the following at the end of the first paragraph:

[Include the following on all projects:]

No separate or additional payment will be made for the adjustment of survey monument lids. Payment shall be considered as included in the Contract Unit Price for "ASPHALT RUBBER HOT MIX."

[End inclusion.]

[Include the following for QA/QC projects:]

Payment for compaction testing shall be considered as included in the Contract Unit Price for "ASPHALT RUBBER HOT MIX."

[End inclusion.]

[Include the following for QA/QC projects if the Agency will core the test strip:]

Add the following:

Payment for asphalt rubber hot mix placed in the test strip will be made at the Contract Unit Price per ton for "ASPHALT RUBBER HOT MIX (TEST STRIP)." The Contract Unit Price shall also include establishing and maintaining traffic control, and furnishing, placing and compacting asphalt rubber hot mix of the same type and class as the test strip in the core holes.

[End inclusion.]

[Include the following two paragraphs for QA/QC projects if the Contractor will perform the coring:]

Add the following:

Payment for asphalt rubber hot mix placed in the test strip will be made at the Contract Unit Price for "ASPHALT RUBBER HOT MIX (TEST STRIP) (INCL CORES)."

No separate payment will be made for test strip pavement cores. Payment shall be considered as included in the Contract Unit Price for "ASPHALT RUBBER HOT MIX (TEST STRIP) (INCL CORES)." The Contract Unit Price shall also include extracting the cores, furnishing the cores to the Engineer, establishing and maintaining traffic control, and furnishing, placing and compacting asphalt rubber hot mix of the same type and class as the test strip in the core holes.

[End inclusion.]

[Include the following two paragraphs for QA/QC Projects:]

Payment for ARHM in which the relative compaction, by lot, is less than 95 percent, but equal to or greater than 92.0 percent, will be made at the Contract Unit Price minus (the Reduced Compensation Factor multiplied by the Contract Unit Price) in accordance with the following table:

TABLE 302-9.9 (A)

		· · · · · · · · · · · · · · · · ·	
Relative	Reduced	Relative	Reduced
Compaction	Compensation	Compaction	Compensation
(Percent)	Factor	(Percent)	Factor
95.0	0.000	93.4	0.062
94.9	0.002	93.3	0.068
94.8	0.004	93.2	0.075
94.7	0.006	93.1	0.082
94.6	0.009	93.0	0.090
94.5	0.012	92.9	0.098
94.4	0.015	92.8	0.108
94.3	0.018	92.7	0.118
94.2	0.022	92.6	0.129
94.1	0.026	92.5	0.142
94.0	0.030	92.4	0.157
93.9	0.034	92.3	0.175
93.8	0.039	92.2	0.196
93.7	0.044	92.1	0.225
93.6	0.050	92.0	0.300
93.5	0.056		

Should the compaction of any lot be less than 92.0 percent, the lot shall be removed and replaced at the Contractor's expense.

[End inclusion.]

302-10 ASPHALT RUBBER AND AGGREGATE MEMBRANE.

302-10.1 Application. Add the following before the first paragraph:

The Contractor or Subcontractor placing the ARAM shall hold a valid permit to operate from the jurisdictional air quality agency at the time of submission of the Bid and at all times during ARAM placement. Prior to award of the Contract, the Contractor shall submit a copy of the valid permit to the person named in 2-5.3 of Section G.

The Contractor shall be solely responsible for delays and associated cost increases due to the Contractor's or its Subcontractor's failure to maintain a valid permit to operate, and for any cessation in operations ordered by the jurisdictional air quality agency.

Prior to application, the existing pavement surface shall be prepared as follows:

- a) Cracks wider than 1/4 inch shall be blown out with compressed air or a leaf blower.
- b) Weeds within cracks shall be removed.
- c) A herbicide shall be applied where the weeds were removed. The herbicide shall be "Roundup" by Monsanto or Agency-approved equal.
- d) The roadway shall be swept with a self-propelled street sweeper or kick broom.
- **302-10.2 Screenings.** Replace the last sentence of the fifth paragraph with the following:

If the ARAM is to be used as an interlayer, a flush coat shall be applied if resurfacing is not scheduled within **4 Days** of the date of the ARAM placement.

302-10.5 Measurement and Payment. Replace the entire subsection with the following:

Asphalt rubber and aggregate membrane will be measured by the square yard.

Payment for asphalt rubber and aggregate membrane will be made at the Contract Unit Price per square yard for "ASPHALT RUBBER AND AGGREGATE MEMBRANE." The Contract Unit Price shall include pavement preparation, furnishing and applying asphalt rubber and screenings, rock dust blotter, and flush coat.

302-12 TIRE RUBBER MODIFIED ASPHALT CONCRETE (TRMAC).

302-12.1 General. Add the following:

The class and grade shall be as shown on the Plans.

The Contractor shall schedule the paving work such that no longitudinal drop-offs on the pavement will remain overnight in the travelled way. Any transverse drop-offs on the pavement over 1 inch in height that will remain overnight shall be ramped with temporary AC pavement.

[Include the following if the Work includes full-width cold milling and placement of TRMAC directly over the cold milled surface, not on an ARAM:]

Roadways to receive full-width cold milling shall be resurfaced within **24 hours** of cold milling any portion of the Work.

[End inclusion.]

[Include the following if the Work includes placement of TRMAC over an ARAM:]

TRMAC to be placed over an ARAM shall be placed within **48 hours** after the completion of the ARAM.

[End inclusion.]

[Include the following for QA/QC projects:]

Add the following:

302-12.1.1 Quality Control Program. The Contractor shall submit a "Quality Control Program for Tire Rubber Modified Asphalt Concrete" per 2-5.3.4. This program shall include the name(s) of personnel responsible for quality control, their qualifications, and specific procedures to be followed during tire rubber modified asphalt concrete placement operations.

The Contractor shall maintain accurate records of all tests it performs as part of its Quality Control Program and shall make these records available to the Engineer upon request. The Contractor shall satisfy itself that its materials and workmanship, including those of its subcontractors and suppliers, are in conformance with the Contract Documents. The Contractor shall submit to the Engineer for review copies of the results of all Quality Control tests it has performed prior to requesting the Agency to perform Quality Assurance testing.

[End Inclusion]

302-12.3 Distribution and Spreading. Replace the second sentence of 302-9.3 of the SSPWC with the following:

TRMAC shall not be placed until the atmospheric temperature is a minimum of 55° F and rising, and the surface temperature of the underlying material is a minimum of 55° F. TRMAC shall also not be placed during unsuitable weather.

Add the following:

The spreading and finishing machine shall be equipped with a fully automatic screed control system which shall be in operation at all times during placement of the surface course. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, and placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material.

[Include the following if pavement edge treatments are shown on the typical sections for unimproved roadway segments:]

Pavement edges along unimproved roadways shall be constructed in accordance with the "Pavement Edge Treatments" detail included herein at the end of this Section R. Pavement edge treatments shall be constructed monolithically with the adjacent lane or shoulder by a paving machine attachment (device) specifically designed and constructed to produce pavement beveled edges.

Shoulders shall be graded as necessary to accommodate the edge treatment. The subgrade upon which the edge treatment is to be placed shall be free of debris and vegetation, and compacted.

The device must be capable of shaping and compacting TRMAC to the cross section shown on the detail. Compaction shall be obtained by constraining the asphalt concrete to reduce the cross sectional area by 10 to 15 percent. The device shall be capable of producing a uniform surface texture without tearing, shoving, or gouging, and of transitioning to. The resultant surface texture shall not contain ridges or indentations.

The angle of the slope shall not deviate by more than \pm 5 degrees from the angle shown on the detail when measured from the plane of the adjacent finished pavement surface.

If paving is done in multiple lifts, the safety edge treatment can be placed either with each lift or with the final lift.

Commercially available devices are described under "3.2 Equipment – AC Safety Edge_{SM} Devices" at the following web site:

<u>http://www.fhwa.dot.gov/everydaycounts/technology/safetyedge/designconst/ch3.cfm</u>#s341

[End inclusion.]

[Include the following for QA/QC projects:]

Add the following subsections:

302-12.3.1 Test Strip. The first order of work during distribution and spreading shall be the placement of a test strip. The quantity of the test strip shall be 500 tons. The test strip shall be incorporated into the Work. The test strip shall be located such that it does not have to be opened to traffic immediately upon completion of rolling operations. The Contractor shall not open the test strip to traffic until coring has been completed and the Engineer has so approved.

[Include the following if the Agency will perform the coring:]

302-12.3.2 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 302-12.4. The Contractor shall allow 2 Working Days, beginning the next Working Day following the day coring operations are completed, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[Include the following if the Contractor will perform the coring:]

302-12.3.2 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 302-12.4. The Contractor shall allow 2 Working Days, beginning on the next working day following the day the cores are furnished to the Engineer, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[End Inclusion]

- **302-12.4 Rolling.** Replace the 3rd paragraph of 302-5.6.2 of the SSPWC with the following:
 - b) California Test Method 308, Method A (modified to use zinc stearate) when slabs or cores are taken for laboratory testing.

[Include the following for QA/QC projects:]

The Contractor shall determine the in-place density and relative compaction of TRMAC placed on this Project as part of its Quality Control Program if the total tonnage is 1801 or greater. The Contractor shall follow the procedures and methods specified in California Test 375, February 2012 (included herein at the end of this Section R) modified as follows:

PART 1. STANDARDIZATION AND CALIBRATION OF THE NUCLEAR DENSITY DEVICE GAGE

1A. APARATUS

1. Add the following:

The nuclear device shall be specifically designed to determine the density of asphalt concrete.

PART 2. CORRELATION WITH CORE DENSITIES

2A. TEST STRIP

- 1. Add the following:
 - d. The test strip shall conform to 302-12.3.1. The Contractor shall notify the Engineer 24 hours prior to the placement of the test strip. The Agency's Materials Laboratory will assist the Contractor in determining the Contractor's nuclear gauge correlation value.

2. Add the following:

The nuclear density values shall be determined by the Contractor and furnished to the Engineer or Agency representative present during test strip operations.

2B. CORRELATING TO CORES

1. Add the following: [Select one of the following as appropriate:]

The Agency will obtain the cores. The Contractor shall establish the traffic control necessary for the Agency to safely perform the coring operations. Traffic control shall be maintained until the Agency has completed coring operations. Upon the completion of coring operations, the Contractor shall furnish, place, and compact TRMAC of the same type and class as the test strip in the core holes.

The Contractor shall core the test strip and furnish the cores to the Engineer. Upon the completion of coring operations, the Contractor shall furnish, place, and TRMAC of the same type and class as the test strip in the core holes.

4. Replace with the following:

The Agency will determine the density of each core in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate.

6. Add the following:

The Agency will determine the average core density for each test site and furnish to the Contractor within 2 Working Days of receipt of the cores by the Engineer.

7. Add the following:

The Agency will determine the correlation value for each test site and furnish to the Contractor.

PART 3. TEST SITE SELECTION

A. SCOPE

Add the following:

The basis of reporting test results to the Engineer shall be a Lot. A Lot shall be defined as the amount of pavement placed in 1 Day. A Sub-Lot shall be defined as 500 tons. Should the amount of pavement placed in 1 day be less than 500 tons, the Sub-Lot and Lot shall be one and the same. Each Lot shall be from a single source unless otherwise approved by the Engineer.

B. TESTING FREQUENCY

4. Replace with the following:

The Contractor shall test a minimum of 10 sites for each 500 tons of TRMAC placed.

5. Replace with the following:

For areas containing less than 500 tons, the Contractor shall test at the rate of 1 test site for each 50 tons or portion thereof of TRMAC placed.

PART 4. DETERMINING IN-PLACE DENSITY BY THE NUCLEAR DENSITY

B. APPARATUS/MATERIAL

1. Add the following:

The nuclear device shall be specifically designed for testing the density of asphalt concrete.

C. DETERMINING IN-PLACE DENSITY

Add the following:

- 13. The Contractor shall furnish the Engineer with a copy of the test results for each Sub-Lot at the end of each Working Day. The test results shall identify the Lot and Sub-Lot in the following manner:
 - 1) Each Lot shall be consecutively numbered (i.e. first day of paving, Lot "1"; second day of paving, Lot "2"; ...)
 - 2) Each Lot shall be divided into Sub-Lots of 500 tons each and shall be consecutively lettered starting with Sub-Lot "A" (i.e. the first Sub-Lot of the first day of paving will be Lot "1-A", the second Sub-Lot of the first day of paving will be Lot "1-B"...the first Sub-Lot of the second day of paving will be Lot "2-A", ...). A Sub-Lot may, when approved by the Engineer, be placed at 2 separate locations as long as placement is in conformance with the Specifications and the Contractor clearly identifies the location and limits of the placement.

PART 5. DETERMINING TEST MAXIMUM DENSITY

A. SCOPE

Add the following:

The Agency will determine the TMD using the laboratory procedure (LTMD). The Agency may, at its option, use the field procedure (FTMD). The Agency will furnish the Contractor with the TMD to be used for the purpose of calculating relative compaction per Part 6.

PART 6. CALCULATING RELATIVE COMPACTION

Add the following:

4. The Agency will take a set of 3 cores per Sub-Lot for the purposes of determining in-place density. In-place density will be determined by the Agency in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate. The average in-place density of the 3 cores will be used for the purpose of calculating relative compaction per Part 6. The Agency, at its option, may determine the average in-place density using a nuclear device in accordance with California Test 375. In the event of a dispute between the results obtained by the Contractor using the nuclear device, and the results obtained by the Agency using California Test 308, the latter results shall prevail.

[End Inclusion]

Add the following:

Dense-graded mixtures shall be compacted with the vibrator off during the initial breakdown rolling.

302-12.5 Joints. Add the following:

Longitudinal joints shall coincide with traffic lane lines unless otherwise approved by the Engineer.

302-12.6 Manholes (and Other Structures). Replace the entire paragraph with the following

Manholes and other structures shall conform to 302-5.8 of the SSPWC except sewer structures, other than those owned by the County Sanitation Districts of Los Angeles County, and storm drain structures extending 2 inches or more above the new subgrade shall be removed by the Contractor to the new subgrade before paving.

Add the following after the first sentence of the third paragraph of 302-5.8 of the SSPWC:

Manhole frames and covers shall be cleaned prior to placement of the surface course.

Replace the second sentence of the third paragraph of 302-5.8 of the SSPWC with the following:

The Contractor shall fill the remaining 1-1/2 inches (38 mm) with asphalt concrete (D2-PG 64-10).

Add the following:

Survey monument lids shall be adjusted by the Contractor to the new finished surface. Survey monuments will be located and marked by the Agency prior to the start of the Work. During the progress of the Work, cold millings, hot or cold mix asphalt concrete materials, and other debris shall not be deposited in survey monument wells. Each well shall be free of debris prior to adjustment. Should the monument lids be damaged prior to adjustment, the Contractor shall notify the Engineer. The Agency's Survey/Mapping and Property Management Division, Construction Surveys Section, will furnish new lids for the Contractor to install.

302-12.8 Measurement. Replace the first paragraph with the following:

TRMAC will be measured by the ton.

302-12.9 Payment. Replace the first sentence with the following:

Payment for TRMAC will be made at the Contract Unit Price per ton for "TRMAC PAVEMENT."

[Include the following on all projects:]

No separate or additional payment will be made for the adjustment of survey monument lids. Payment shall be considered as included in the Contract Unit Price for "TRMAC PAVEMENT."

[End inclusion.]

[Include the following for QA/QC projects if the Agency will core the test strip:]

Add the following:

Payment for TRMAC placed in the test strip will be made at the Contract Unit Price per ton for "TRMAC PAVEMENT (TEST STRIP)." The Contract Unit Price shall also include establishing and maintaining traffic control, and furnishing, placing and compacting TRMAC of the same type and class as the test strip in the core holes.

[End Inclusion.]

[Include the following two paragraphs for QA/QC projects if the Contractor will perform the coring:]

Add the following:

Payment for TRMAC placed in the test strip will be made at the Contract Unit Price for "TRMAC PAVEMENT (TEST STRIP) (INCL CORES)."

No separate payment will be made for test strip pavement cores. Payment shall be considered as included in the Contract Unit Price for "TRMAC PAVEMENT (TEST STRIP) (INCL CORES)." The Contract Unit Price shall also include extracting the cores, furnishing the cores to the Engineer, establishing and maintaining traffic control, and furnishing, placing and compacting asphalt rubber hot mix of the same type and class as the test strip in the core holes.

[End inclusion.]

[Include the following two paragraphs for QA/QC Projects:]

Payment for TRMAC in which the relative compaction, by lot, is less than 95 percent, but greater than 91.9 percent, will be made at the Contract Unit Price minus (the Reduced Compensation Factor multiplied by the Contract Unit Price) in accordance with the following table:

TABLE 302-12.9

	TABLE 302-12.9		
Relative	Reduced	Relative	Reduced
Compaction	Compensation	Compaction	Compensation
(Percent)	Factor	(Percent)	Factor
95.0	0.000	93.4	0.062
94.9	0.002	93.3	0.068
94.8	0.004	93.2	0.075
94.7	0.006	93.1	0.082
94.6	0.009	93.0	0.090
94.5	0.012	92.9	0.098
94.4	0.015	92.8	0.108
94.3	0.018	92.7	0.118
94.2	0.022	92.6	0.129
94.1	0.026	92.5	0.142
94.0	0.030	92.4	0.157
93.9	0.034	92.3	0.175
93.8	0.039	92.2	0.196
93.7	0.044	92.1	0.225
93.6	0.050	92.0	0.300
93.5	0.056		

Should the compaction of any lot be less than 91.9 percent, the lot shall be removed and replaced at the Contractor's expense.

[End QA/QC inclusion.]

SECTION 303 - CONCRETE AND MASONRY CONSTRUCTION

303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, ALLEY INTERSECTIONS, ACCESS RAMPS, AND DRIVEWAYS.

303-5.1 Requirements.

303-5.1.1 General. Add the following:

To facilitate access to properties, the Contractor may be directed to include admixtures or additional cement in the concrete mix for driveway aprons.

Add the following:

303-5.1.4 Curb Ramps. Curb ramps shall conform to the Standard Plans referenced, and details shown, on the Plans.

303-5.3 Placing Concrete. Add the following:

Concrete for walk, driveways, and access ramps (curb ramps) shall not be placed monolithically with curbs, integral curbs and gutters or gutters. Concrete for such shall not be placed until a minimum of 4 hours after concrete for the adjoining curb or gutter has been placed.

Add the following after the second paragraph:

At locations where new sidewalk will join a wall, the sidewalk shall be placed in two separate pours. The first pour shall include the portion of the walk from the back of the curb to approximately 6 inches off the face of the wall or as directed by the Engineer. The second pour shall be between the wall and the edge of the walk previously placed. Full compensation for complying with these requirements shall be considered as included in the Contract Unit Prices for the various items of work.

303-5.5 Finishing.

303-5.5.3 Walk. Replace the second paragraph with the following:

After concrete has been deposited in place, it shall be thoroughly tamped in such a manner that coarse aggregate will be forced down and a layer of free mortar approximately 1/4 inch thick covers the surface. The concrete shall be screeded to the required grade and floated to a smooth, flat, uniform surface. Immediately after the initial set has taken place, the surface shall be broom-finished. Broom-finishing shall be accomplished by a fine-hair broom and shall be performed perpendicular to the centerline of the adjacent roadway as directed by the Engineer.

303-5.5.5 Alley Intersections, Access Ramps, and Driveways. Add the following:

Curb ramps shall have a prefabricated detectable warning surface installed in the areas shown on the Standard Plan. The detectable warning surface shall have the dimensions and dome spacing as shown on the Standard Plan and shall be yellow conforming to Federal Standard 595B, Color No. 33538. The detectable warning surface shall be surface applied or cast-in-place truncated dome detectable warning systems as produced by Armor Tile, (800) 682-2525, www.armor-tile.com, or ADA Solutions, Inc., (800) 372-0519, www.adatile.com, or Agency-approved equal. The detectable warning surface shall be installed in accordance with the manufacturer's recommendations and instructions and for surface applied systems shall include the installation of anchors at the corners of each individual piece, and along the edges or seams, spaced a maximum of 2 feet apart. The manufacturer shall provide a 5-year warranty, guaranteeing replacement when there is a defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience or attachment. The warranty period shall begin on the date of acceptance of the Contract.

303-5.8 Backfilling and Clean-Up. Add the following:

All parkway areas which will not be covered with new walk, driveways, or curb ramps shall be backfilled with clean native soil as directed by the Engineer. Such material will not be considered as Selected Material.

303-5.9 Measurement and Payment. Add the following:

Payment for the placement and removal of forms (including excavation), backfilling, grading, shaping, preparation of subgrade, root pruning not requiring the use of root control barriers, and other incidental costs connected with the construction of walk, curb ramps, cross gutters, and driveways shall be considered as included in the Contract Unit Price for the applicable Bid item.

Payment for the construction of retaining curbs integral with curb ramps, if so required by the curb ramp case and type specified on the Plans, shall be considered as included in the Contract Unit Price for the applicable Bid item for curb ramps.

[Include the following if curb ramps are measured by the cubic yard:]

Curb ramps will be measured by the cubic yard within the limits shown on the Plans. Payment will be made at the Contact Unit Price per cubic yard for "Curb Ramps."

[End inclusion.]

Payment for construction of detectable warning surfaces will be made at the Contract Unit Price for "DETECTABLE WARNING SURFACE."

Payment for admixtures or additional cement to achieve high early strength, if so directed by the Engineer, will be made on the basis of Extra Work for the additional cost of the materials only.

[Edit the following as appropriate.]

303-6 STAMPED CONCRETE.

303-6.3 Pattern. Add the following:

The pattern shall be Bomanite "Running Bond Brick," or Agency-approved equal. The Contractor shall submit the pattern to the Engineer for approval per 2-5.3.4.

303-6.4 Curing. Add the following:

Curing compound shall be Brick Red (A-26) "Lithochrome Colorwax" as manufactured by L.M. Scofield Company, or Agency-approved equal. The Contractor shall submit the curing compound to the Engineer for approval per 2-5.3.4.

303-7 COLORED CONCRETE.

303-7.1 General. Replace the first sentence with the following:

Concrete of the specified color shall be produced by Method A.

303-7.2 Method A (Dry Shake). Add the following:

Color hardener shall be Brick Red (A-26) "Lithochrome Colorwax" as manufactured by L.M. Scofield Company, or Agency-approved equal. The minimum rate of application shall be 60 pounds per 100 square feet. The Contractor shall submit the color hardener to the Engineer for approval per 2-5.3.4.

[End edit.]

Add the following subsection:

303-9 TREE WELLS AND TREE WELL COVERS.

- **303-9.1 General.** Tree wells of the type specified on the Plans shall be constructed per Standard Plan 519. Unless otherwise specified on the Plans, tree well covers shall be furnished and installed at each tree well location. When noted on the Plans, tree well covers of the specified type shall be furnished and installed at locations of existing tree wells.
- **303-9.2 Measurement and Payment.** The Contract Unit Price for "TREE WELL AND COVER PER STD PLAN 519" for each type of tree well shall be considered as including all work necessary to construct each tree well in conformance with Standard Plan 519, including furnishing and installing tree well covers.

[Include the following if the Total Contract Estimate includes a Bid item for Tree Well Cover:]

The Contract Unit Price for "TREE WELL COVER (POROUS) PER STD PLAN 519" shall be considered as including all work necessary to furnish and install tree well covers conforming to Standard Plan 519. For two-piece covers, the Contract Unit Price shall be for each piece.

[End inclusion.]

SECTION 304 - METAL FABRICATION AND CONSTRUCTION

304-2 METAL RAILINGS.

304-2.2 Not Used. Replace the entire subsection with the following:

304-2.2 Metal Beam Guard Railing.

304-2.2.1 General. Metal beam guard railing shall conform to Section 83-1.02B, "Metal Beam Guard Railing," of the Caltrans Standard Specifications, 2010 edition, the applicable 2010 Caltrans Standard Plans, the Plans, and these Special Provisions.

The work shall consist of the construction of metal beam guard railing (including terminal system end treatments, and end anchor assemblies) at the locations shown on the Plans.

At locations where traffic is adjacent to metal beam guard railing work, all materials required to complete the guard railing work at any 1 location must be available before work starts at that location.

At locations exposed to traffic, schedule activities so that at the end of each day no post holes are open and no railing posts are installed without the blocks and rail elements assembled and mounted.

Welding must comply with AWS D1.1. Welds on exposed surfaces must be ground flush with the adjacent surfaces.

Galvanize completed steel parts and hardware for railings under Section 75-1.05 of the Caltrans Standard Specifications, 2010 edition. After galvanizing, railing elements must (1) be free of fins, abrasions, rough or sharp edges, and other surface defects and (2) not be kinked, twisted, or bent. If straightening is necessary, the method used must be authorized. Railing elements with kinks, twists, or bends may be rejected.

Clean and re-galvanize (1) abraded or damaged galvanized surfaces of steel railing and posts and (2) ends of steel railing cut after galvanizing, except if allowed by the Engineer, you may make repairs to the surfaces under Section 75-1.05 of the Caltrans Standard Specifications, 2010 edition

Replace the seventh paragraph of Section 83-1.02B with the following:

Construct metal beam guard railing using:

- 1. The type of posts shown on the Plans.
- 2. Wood blocks for line posts.

304-2.2.2 Terminal System.

- **304-2.2.1 General.** Terminal system shall conform to Section 83-1.02C, "Terminal System", of the Caltrans Standard Specifications, 2010 edition, the applicable 2010 Caltrans Standard Plans, the Plans, and these Special Provisions.
- **304-2.2.2 Alternative In-Line Terminal System.** Replace Section 83-1.02C(2) of the Caltrans Standard Specifications, 2010 edition with the following:

Alternative in-line terminal system must be furnished and installed as shown on the Plans and under these Special Provisions.

The allowable alternatives for an in-line terminal system must consist of the following or a Caltrans-authorized equal:

- a) TYPE SKT TERMINAL SYSTEM Type SKT terminal system must be a SKT 350 sequential kinking terminal manufactured by Road Systems, Inc., located in Big Spring, Texas, and must include items detailed for Type SKT terminal system shown on the Plans. The SKT 350 sequential kinking terminal can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, telephone (801) 785–0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, telephone (330) 477–4800.
- b) TYPE ET TERMINAL SYSTEM Type ET terminal system must be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Highway Products, LLC, and must include items detailed for Type ET terminal system shown on the Plans. The ET-2000 PLUS (4-tube system) extruder terminal can be obtained from the manufacturer, Trinity Highway Products, LLC, P.O. Box 99, Centerville, UT 84012, telephone (800) 772–7976.

A Certificate of Compliance conforming to 4-1.5 shall be submitted to the Engineer prior to installation.

Terminal systems must be installed under the manufacturer's installation instructions and these Special Provisions. Each terminal system installed must be identified by painting the type of terminal system in neat black letters and figures 2 inches high on the backside of the rail element between system posts numbers 4 and 5.

For Type ET terminal system, the steel foundation tubes with soil plates attached must be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. The wood terminal posts must be inserted into the steel foundation tubes by hand and must not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149°F or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For Type SKT terminal system, the soil tubes must be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. Wood posts must be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149°F or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

After installing the terminal system, dispose of surplus excavated material in a uniform manner along the adjacent roadway where designated by the Engineer.

304-2.2.3 Alternative Flared Terminal System. Replace Section 83-1.02C(3) with the following:

Alternative flared terminal system must be furnished and installed as shown on the Plans and under these Special Provisions.

The allowable alternatives for a flared terminal system must consist of one of the following or a Caltrans-authorized equal:

- a) TYPE FLEAT TERMINAL SYSTEM Type FLEAT terminal system must be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and must include items detailed for Type FLEAT terminal system shown on the Plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, telephone (801) 785–0505 or from the distributor, Gregory Industries, Inc., 4100 13th Street, S.W., Canton, OH 44708, telephone (330) 477–4800.
- c) TYPE SRT TERMINAL SYSTEM Type SRT terminal system must be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Highway Products, LLC, and must include items detailed for Type SRT terminal system shown on the Plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Highway Products, LLC, P.O. Box 99, Centerville, UT 84012, telephone (800) 772–7976.

A Certificate of Compliance conforming to 4-1.5 shall be submitted to the Engineer prior to installation.

Terminal systems must be installed under the manufacturer's installation instructions and these specifications. Each terminal system installed must be identified by painting the type of terminal system in neat black letters and figures 2 inches high on the backside of the rail element between system posts numbers 4 and 5.

For Type SRT terminal system, the steel foundation tubes with soil plates attached must be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. The wood terminal posts must be inserted into the steel foundation tubes by hand and must not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149°F or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For Type FLEAT terminal system, the soil tubes must be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. Wood posts must be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149°F or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

After installing the terminal system, dispose of surplus excavated material in a uniform manner along the adjacent roadway where designated by the Engineer.

304-2.2.4 Type CAT Terminal System. Replace Section 83-1.02C(4) of the Caltrans Standard Specifications, 2010 Edition, with the following:

Type CAT terminal system and Type CAT terminal system backup must be furnished and installed as shown on the Plans and under these Special Provisions.

Type CAT terminal system must be a CAT-350 crash cushion attenuating terminal as manufactured by Trinity Highway Products, LLC, and must include items detailed for Type CAT terminal system shown on the Plans.

Type CAT terminal system backup must consist of items detailed for Type CAT terminal system backup shown on the Plans, and must comply with the specifications in Section 83-1.02B.

A Certificate of Compliance conforming to 4-1.5 shall be submitted to the Engineer prior to installation.

The Type CAT terminal system must be installed under the manufacturer's installation instructions and these Special Provisions. The steel foundation tubes with soil plates attached must be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. Wood posts must be inserted into the steel foundation tubes by hand. Before the wood posts are inserted, the inside surfaces

of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149°F or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

After installing the Type CAT terminal system and backup, dispose of surplus excavated material in a uniform manner along the adjacent roadway where designated by the Engineer.

304-2.2.3 Measurement and Payment. Measurement and payment will be made in accordance with Section 83-1.03, "Payment," of the Caltrans Standard Specifications, 2010 edition and the following:

[Edit the following as appropriate:]

The Contract Unit Price per linear foot for "METAL BEAM GUARD RAILING" shall include full compensation for furnishing and installing metal beam guard railing, complete in-place.

The Contract Unit Price per linear foot for "TRANSITION RAILING (TYPE WB)" shall include full compensation for furnishing and installing transition railing (Type WB), complete in-place.

Terminal systems will be measured by "each."

The Contract Unit Price for each "ALTERNATIVE IN-LINE TERMINAL SYSTEM" shall be considered as including full compensation for furnishing and installing an alternative in-line terminal system, complete in place.

The Contract Unit Price for each "ALTERNATIVE FLARED TERMINAL SYSTEM" shall be considered as including full compensation for furnishing and installing an alternative flared terminal system, complete in-place.

The Contract Unit Price for each "TYPE CAT TERMINAL SYSTEM" shall include full compensation for furnishing and installing transition railing (Type WB), complete in place.

[End edit.]

[Include the following if "Erosion Control Blanket" is shown on the Plans and not specified in Section L. Ensure a Bid item is included for "Erosion Control Blanket."]

PART 8 LANDSCAPING AND IRRIGATION

SECTION 801 - INSTALLATION

801-4 PLANTING.

801-4.9 Erosion Control Planting.

Add the following subsection:

801-4.9.6 Erosion Protection Blanket.

801-4.9.6.1 General. Erosion protection blanket shall consist of jute matting and hydroseed applied at the locations shown on the Plans.

801-4.9.6.2 Materials.

a) Seed. Seed shall be delivered to the Project site tagged and labeled in accordance with the California Agricultural Code.

Seed shall be a quality which has a minimum pure live seed content of 80 percent (% purity x % germination) and weed seed shall not exceed 0.5 percent of the aggregate of pure live seed and other material.

The hydroseed mixture shall consist of the following:

[The following is the seed mix used on Saddle Peak Road at M.M. O.88. Remove and insert the seed mix specifications from AED:]

Species	lbs/Acre	Minimum % Purity/Germination
Artemesia california/California sagebrush	.2	15/50
Cercocarpus betubloides/Mountain mahogany	.5	50/40
Keckiella cordifolia / Heartleaf penstemon	.2	10/65
Malosma laurina / Laurel sumac	2.5	95/40
Encelia California / Bush Sunflower	1.0	40/60
Eriophyllum confertiflorum / Golden Yarrow	1.0	30/60
Lotus scoparius / Deerweed	6.0	90/60
Lupinus nanus / Sky Lupine	2.0	98/70
Mimulus aurantiacus longiflorus / Monkey Flov	ver .2	5/70
Sambucus mexicana / Elderberry	3.0	95/29
Bromus carinatus / California Brome	4.0	95/80

Melica imperfecta / Coastrange Melic	3.0	90/60
Nessela pulchra / Purple needle grass	8.0	70/60
Leymus condensatus / Gian wild rye	1.0	70/80
Elymus glaucus / Blue Wild Rye	4.0	90/80
Vulpia microstachys / Small Fescue	8.0	95/80
	44.6	

- **b)** Commercial Fertilizer. Fertilizer shall be "Gro-Power Controller Release (12-8-8)," or Agency-approved equal. Fertilizer shall be applied at the rate of 200 lbs. per acre.
- c) Jute Matting. Jute matting shall be of a uniform, open, plain weave, with single jute yarn not varying in thickness by more than one-half of its normal diameter. Jute matting shall be furnished in rolled strips as follows:

i) Length: Approximately 50 to 75 yards.

ii) Width: 45" to 50".

- **d) Binder.** Binder shall be "Ecology Control M. Binder" or Agency- approved equal. Binder shall be applied at the rate of 150 pounds per acre.
- **e) Hydromulch.** Hydromulch shall consist of long fiber, virgin wood material. Hydromulch shall be applied at the rate of 1,500 pounds per acre.

801-4.9.6.3 Installation.

- a) Seedbed Preparation. The area to be seeded shall have a firm seedbed which has previously been roughened by scarifying, disking, harrowing, chiseling, or otherwise worked to a depth of 2 to 4 inches. No implement shall be used that will create an excessive amount of downward movement of soil or clods on sloping areas. The seedbed may be prepared at the time of completion of earthwork.
- b) Hydroseeding Mixture. The hydroseed mixture shall consist of the specified speed, fertilizer, hydromulch, and binder. The hydroseed mixture shall be mixed in a mixer with a minimum 1,500-gallon capacity. The hydroseed mixture shall be uniformly applied under pressure over the area shown on the Plans after installation of the jute mat.
- **c) Fertilizing.** Fertilizer shall be uniformly spread at a rate of 15 pounds per 1,000 square feet of surface.
- **d) Watering.** Water shall be applied in quantities that will thoroughly moisten the soil for a depth of 3 inches but not erode the surface.

- e) Jute Matting Placement. Jute matting shall be placed using staples constructed of 12-inch lengths of 8 gauge wire. Placement shall conform to the following:
 - i) Jute matting shall be applied without stretching and lie smoothly but loosely on the soil surface. In cases where one roll of matting ends and a second roll starts, the uphill piece shall be brought over the buried end of the second roll so that there is a 12-inch overlap. Where two or more widths of matting are applied, side by side, the overlap shall not be less than 4 inches. All edges shall be stapled every 10 feet. At critical points such as inlets and check slots, staples shall be spaced closer as required.
 - ii) Check slots shall be constructed before the matting is rolled out. A narrow trench shall be dug across the slope perpendicular to the direction of the flow. Jute matting shall be folded, the same length as the trench, and pressed together. The location of check slots shall be a maximum of 50 feet apart.
 - iii) Outside edges, centers and overlaps on banks shall be stapled across the slope at 6-inch intervals.
 - iv) Loose topsoil shall be spread over the outside edges to allow for smooth entry of water.
 - v) Jute matting shall be dressed with a thin layer of topsoil. After the top dressing, the yards shall still be visible.
 - vi) Jute matting shall be rolled with a smooth roller. The weight of the roller shall be 50 to 75 pounds per foot of length.
 - vii) Any clods, etc. which hold the jute off the ground shall be stamped into the soil. Jute matting shall be forced down into any depressions and held there with a staple.
 - viii) Jute matting shall completely cover all areas shown on the Plans to be covered by an erosion control blanket.

801-6 MAINTENANCE AND PLANT ESTABLISHMENT. Add the following:

The Contractor shall maintain the erosion control blanket area for a period of 90 Days from completion of acceptance of the Work. Watering of the erosion control blanket area shall be performed a minimum of once per week throughout the maintenance period. Weeding shall be performed as necessary to remove all weeds. Damaged or eroded portions shall be repaired and reseeded as necessary to the satisfaction of the Engineer.

801-7 MEASUREMENT. Add the following:

Erosion control blanket will be measured by the square yard. Calculation of the number of square yards of blanket for payment will be based on field measurements of the lengths and widths of blanket constructed, measured on the slopes of the completed blankets. Lapped and folded areas will not be measured separately.

801-8 PAYMENT. Add the following:

Payment for furnishing and installing the erosion control blanket will be made at the Contract Unit Price for "EROSION CONTROL BLANKET". No additional payment will be made for areas requiring lapping and folding.

Payment for maintenance of the erosion control blanket during the period specified will be made at the lump sum Bid price for "HYDROSEED ESTABLISHMENT."

Add the following:

PART 9 - MODIFIED PAVEMENTS, PAVEMENT PRESERVATION, AND PAVEMENT RECYCLING PROCESSES

SECTION 900 - MICRO-MILLING

- **900-1 GENERAL.** Micro-milling shall consist of the cold milling of existing asphalt concrete pavement with a milling machine equipped with a cutting drum specifically designed and constructed for micro-milling.
- **900-2 MILLING MACHINES.** Milling machines shall conform to 302-1.2 and the following:
 - h) Be equipped with a micro-milling drum with tungsten-carbide-tipped cutting teeth spaced no greater than 1/4 inch apart on center. The configuration of the teeth shall be such that the deviation in elevation between any 2 teeth does not exceed 1/16 inch.
 - i) Be capable of removing asphalt concrete pavement to a tolerance of \pm 1/8 inch.
 - j) Be equipped with an automatic grade control system operating in "profile" mode. The system shall be either:
 - i) a 30-foot-long paving machine ski with spring-loaded feet attached to the bottom on not more than 1.5-foot increments, such that the feet rise and fall over small irregularities on the pavement surface. The upper part of the ski shall be one piece and of such construction that it will not flex or bend by more than 1/8 inch at either end when supported off the grade by a fixture located at its center of gravity. The grade control system shall be referenced off the center of the ski, with skis mounted on each side of the milling machine such that the ski's longitudinal center is even with the center of the milling machine's cutting drum; or,

- ii) a sonic averaging system with automated controls. Each corner of the the milling machine shall be equipped with sonic grade averaging and slope sensors. The system shall feature plug-in connections, internal cable routing, 2 dual control boxes for ground personnel each capable of controlling each side of the milling machine, and a separate control box for the operator.
- k) Be equipped with a Tier III or higher engine compliant with the regulations of the California Air Resources Board.

900-3 MILLING OPERATIONS. Milling operations shall progress from the low side of each roadway barrel or lane and progress towards the high side. Each successive pass of the milling machine shall meet the line and grade of the previous pass. The speed of the milling machine shall be maintained at a rate which results in a uniform pavement texture.

Micro-milling shall result in a grid-patterned textured pavement surface with longitudinal ridges approximately the same distance apart as the cutting teeth. The ridges shall be consistent in depth, width, and profile. The distance between the top of each ridge and the adjacent valleys shall not exceed 1/8 inch.

The resulting profile and cross slope of the milled pavement surface shall be such that a 12-foot long straightedge laid perpendicular or parallel to the centerline will not allow a shim with a width of 1 inch and a thickness of 3/16 inch to pass under the straightedge at any point except at breaks in profile grade or cross slope.

Milled pavement surfaces which do not conform to the requirements above shall be corrected by the Contractor. The Contractor shall prepare and submit to the Engineer for approval a correction plan prior to initiating corrective action.

During milling operations, the cutter teeth shall be regularly checked and replaced as necessary to maintain the tolerances specified in 900-2.

- **900-3 WORK SITE MAINTENANCE.** Work site maintenance shall conform to 7-8. A self-loading motorized street sweeper equipped with both brooms and a vacuum system, and a functional water spray system shall immediately follow the milling machine. Sweeping shall continue until loose millings have been completely removed and as requested by the Engineer. The Contractor shall maintain the micro-milled surface until the surface treatment is applied.
- **900-4 DISPOSAL OF MILLINGS.** Millings shall be considered the property of the Contractor and shall be disposed of by the Contractor. The Contractor shall notify the Engineer a minimum of 2 Working Days prior to the start of milling operations of the disposal location.

900-5 MEASUREMENT. Micro-milling will be measured by the square foot.

900-6 PAYMENT. Payment for micro milling will be made at the Contract Unit Price per square foot for "MICRO-MILL AC PAVEMENT."

SECTION 901 - PCC PAVEMENT GRINDING

- **901-1 GENERAL.** PCC pavement grinding shall consist of grinding existing concrete pavement at the locations shown on the Plans and disposal of the residue.
- **901-2 EQUIPMENT.** Grinding shall be performed with abrasive grinding equipment utilizing diamond cutting blades mounted on a self-propelled machine specifically designed and constructed for grinding and texturing PCC pavement. Grinding equipment that causes raveling, aggregate fracturing, or spalling, or that damages transverse or longitudinal joints shall not be used.
- **901-3 GRINDING REQUIREMENTS.** Grinding shall be performed in the longitudinal direction of the traveled way. The noise level created by grinding operations shall not exceed 86 dBA at a distance of 50 feet at right angles to the direction of travel.

Grinding shall result in a parallel corduroy texture consisting of grooves 5/64 inch to 1/8 inch wide with 55 grooves to 60 grooves per foot width of grinding. Tops of ridges shall be between 1/16 inch and 5/64 inch from the bottom of the blade grooves.

Grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within any one ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

Grinding shall be performed such that the resulting pavement surface on both sides of transverse joints and cracks has the same depth of texture and does not vary from a true plane enough to permit a 5/64-inch thick shim 3-inches wide to pass under a 3-foot straightedge adjacent to either side of the joint or crack when the straightedge is laid on the pavement parallel to the centerline with its midpoint at the joint or crack.

The finished surface shall not vary from a true plane enough to permit a 1/8 inch thick shim, 3 inches wide to pass under a straightedge 12 feet ± 2 -1/2 inches long when the straightedge is laid on the finished surface parallel with the centerline.

Cross-slope uniformity and positive drainage shall be maintained across the entire traveled way. The cross-slope shall be uniform such that when tested with a straightedge 12 feet \pm 2-1/2 inches long placed perpendicular to the centerline, the ground pavement surface shall not vary more than 1/4 inch from the lower edge of the straightedge.

Ground surfaces shall not be smooth or polished and shall have a coefficient of friction of not less than 0.30 as determined by California Test 342.

- **901-4 RESIDUE MANAGEMENT PLAN (RMP).** The Contractor shall prepare and submit in accordance with 2-5.3.4 a RMP. The RMP shall describe and specify the following:
 - a) The Contractor's equipment, methodology, and sequence of work for grinding operations.
 - b) The proposed equipment and methodology to be used for the collection, drying, storage, transportation, and disposal of residue.
 - c) BMPs. Relevant BMPs in the Agency's Construction Site BMPs Manual to be implemented shall be specified.
 - d) Temporary storage site and/or drying location, if any. Documentation of permission from the property owner to use the site for this purpose shall be included.
 - e) Transporter. Documentation of the transporter's current permits and licenses shall be included.
 - f) Disposal facility. Documentation of the facility's current regulatory permits and intent to accept the residue shall be included.
- **901-5 RESIDUE COLLECTION.** Residue from grinding operations shall be picked up by means of a vacuum attachment to the grinding machine and shall not be allowed to flow across the pavement nor be left on the surface of the pavement. Residue shall be disposed of in conformance with local, State and Federal laws.
- **901-6 STORAGE.** Temporary storage of PCC pavement grooving and grinding residues will not be allowed within the street right of way. The Contractor may transport liquid residues to a drying location off the Work site if so specified in the approved RMP.

901-7 TRANSPORTATION AND DISPOSAL. The Contractor shall:

- a) utilize the transporter and disposal facility specified in the approved RMP;
- b) prepare a non-hazardous waste manifest (the generator will be the Agency) for each truckload;
- c) notify the Agency's Environmental Compliance Unit, (626) 458-4970, oenrique@dpw.lacounty.gov, a minimum of 72 hours prior to beginning transportation, and
- d) within 2 Working Days of completion of transportation, submit to the Engineer a report in tabular form showing the gross, tare, and net weight, and manifest number of each truckload sent to the disposal facility.
- **901-8 MEASUREMENT.** PCC pavement grinding will be measured by the square foot.
- **901-9 PAYMENT.** Payment for PCC pavement grinding will be made at the Contract Unit Price per square foot for "GRIND PCC PAVEMENT." Payment shall include preparation and implementation of the Residue Management Plan; PCC pavement grinding; and removal, drying, storage, transportation and disposal of residue.

SECTION 902 – MODIFIED PAVEMENTS

902-4 TIRE RUBBER MODIFIED TACK COAT (TRMTC).

902-4.1 General. TRMTC shall be composed of a blend of elastic polymer modified paving asphalt, thermoplastic resins, and digested whole scrap tire rubber.

902-4.2 Materials. TRMTC shall conform to the following:

TABLE 902-4.2

Test	ASTM Test No.	Specification
Digested Whole Scrap Tire Rubber Description Content, %		1-3
Flash Point, °C	D92	230 Minimum
Solubility, %	D2042	97.5 Minimum
Softening Point, °C	D36	71 Minimum
Penetration @ 77°F, 100g, 5sec, D(mm)	D5	10 Minimum
Rotational Viscosity @ 165 °C, Pa•S	D4402	3.0 Maximum
Rotational viscosity @ 175 °C, Pa•S	D4402	0.3 Maximum

The Contractor shall submit a Certificate of Compliance per 4-1.5 to the Engineer.

902-4.3 Application. TRMTC shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F and rising. TRMTC shall not be applied when rain is imminent.

TRMTC shall be heated slowly to between 325°F and 425°F. At no time shall it be heated above 450°F.

Immediately prior to application, the existing pavement surface shall be thoroughly cleaned.

TRMTC shall be applied by a distributor truck equipped with a:

- a) heating unit,
- b) full circulating spreader bar,
- c) pumping system,
- d) tachometer,
- e) pressure gauge,
- f) volume measuring device, and a
- g) thermometer.

The distributor truck shall be capable of applying TRMTC within a tolerance of +/-0.005 gallons per square yard of the specified application rate and of providing uniform coverage of the surface to be treated.

The temperature of TRMTC at the time of application shall be between 325°F and 425°F.

The application rate shall be between 0.08 to 0.15 gallons per square yard. The Contractor shall apply TRMTC to test strips approximately 100 feet in length. The test strip length and final application rate shall be determined by the Engineer.

- **902-4.4 Measurement.** TRMTC will be measured by the gallon. A density of 8.5957 lbs/gal will be used for weight to volume conversion.
- **902-4.5 Payment.** Payment for TRMTC will be made at the Contract Unit Price for "TIRE RUBBER MODIFIED TACK COAT."

902-6 POLYMER MODIFIED ASPHALT CONCRETE (PMAC) PAVEMENT.

902-6.1 General. Polymer modified asphalt concrete pavement shall consist of one course of polymer modified asphalt concrete (PMAC) placed upon existing or new asphalt concrete pavement, or an interlayer. PMAC shall be of the class and grade specified on the Plans.

The Contractor shall schedule the paving work such that no longitudinal drop-offs on the pavement will remain overnight in the travelled way. Any transverse drop-offs on the pavement over 1 inch in height that will remain overnight shall be ramped with temporary AC pavement.

[Include the following if the Work includes full-width cold milling and placement of PMAC directly over the cold milled surface, not on an ARAM:]

Roadways to receive full-width cold milling shall be resurfaced within **24 hours** of cold milling any portion of the Work.

[Include the following if the Work includes placement of PMAC over an ARAM:]

PMAC shall be placed within **48 hours** of the completion of placement of the asphalt rubber and aggregate membrane (ARAM).

902-6.2 Polymer Modified Asphalt Concrete.

902-6.2.1 General. PMAC shall be the product of mixing mineral aggregate and a maximum of 15 percent reclaimed asphalt pavement (RAP) with polymer modified paving asphalt at a central mixing plant.

PMAC shall be designated by class and grade (i.e. "C2-PG 64-28PM"). PMAC containing up to 15 percent RAP shall be identified by adding the suffix "RAP" to the class and grade (i.e. "C2-PG 64-10PM-RAP").

- 902-6.2.2 Mix Designs. Mix designs shall conform to 203-6.2 except the Hveem mix design shall be submitted with the job mix formula. The mix design shall be no more than one year old and have been based on the paving asphalt to be used. Mix designs based on unmodified paving asphalt or a different modified paving asphalt will not be accepted.
- **902-6.2.3 Polymer Modified Paving Asphalt.** Polymer modified paving asphalt shall conform to Table 902-6.2.3. The Contractor shall submit in accordance with 2-5.3.4 a Certificate of Compliance conforming to 4-1.5 for the paving asphalt to be used.

TABLE 902-6.2.3

Performance Graded Polymer Modified Paving Asphalt^a

	AASHTO Test	Specification Grade	
Property	Method	PG	PG
		64-28 PM	76-22 PM
	Original Bind	er	
Flash Point, Minimum °C	T 48	230	230
Solubility, Minimum % b	T 44 ^c	98.5	98.5
Viscosity at 135°C, d	T 316		
Maximum, Pa·s		3.0	3.0
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		64	76
Minimum G*/sin(delta), kPa		1.00	1.00
RTFO Test,	T 240		
Mass Loss, Maximum, %		1.00	1.00
	RTFO Test Aged	Binder	
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		64	76
Minimum G*/sin(delta), kPa		2.20	2.20
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		Note e	Note e
Maximum (delta), %		80	80
Elastic Recovery ^f ,	T 301		
Test Temp., °C		25	25
Minimum recovery, %		75	65
PAV ⁹ Aging,	R 28		
Temperature, °C		100	110
RTFO Test and PAV Aged Binder			
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		22	31
Maximum G*sin(delta), kPa		5000	5000
Creep Stiffness,	T 313		
Test Temperature, °C		-18	-12
Maximum S-value, MPa		300	300
Minimum M-value		0.300	0.300

Notes:

- a. Do not modify using acid modification.
- b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Caltrans' "Certification Program for Suppliers of Asphalt."
- c. ASTM D5546 may be used instead of AASHTO T 44.
- d. The Engineer will waive this specification if the supplier certifies the paving asphalt can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The Engineer will accept direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
- f. Tests without a force ductility clamp may be performed.
- g. "PAV" means pressurized aging vessel.

- **902-6.2.4 Aggregate.** Aggregate shall conform to 203-6.3.2.
- **902-6.2.5 Mineral Filler.** Mineral filler shall conform to 203-6.3.3.
- 902-6.2.6 Mixtures. Mixtures shall conform to 203-6.4.
- **902-6.2.7 Aggregate Storing, Drying and Screening.** Aggregate storing, drying and screening shall conform to 203-6.5.
 - **902-6.2.8 Proportioning.** Proportioning shall conform to 203-6.6.
 - **902-6.2.9 Mixing.** Mixing shall conform to 203-6.7.
 - **902-6.2.10 Storage.** Storage shall conform to 203-6.8.
- **902-6.2.11 Miscellaneous Requirements.** Miscellaneous requirements shall conform to 203-6.9.
 - 902-6.3 Tack Coat. Tack coat shall conform to 302-5.4.
 - 902-6.4 Distribution and Spreading.
- **902-6.4.1 General.** Distribution and spreading shall conform to 302-5.5 of the SSPWC except as follows:

Replace the fourth paragraph with the following:

Polymer modified asphalt concrete shall not be placed until the atmospheric temperature is a minimum of 55°F and rising, and the surface temperature of the underlying material is a minimum of 55°F. Polymer modified asphalt concrete shall also not be placed during unsuitable weather.

Add the following after the sixth paragraph:

The spreading and finishing machine shall be equipped with a fully automatic screed control system which shall be in operation at all times during placement of the surface course. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material. A joint maker placed on the side of the spreading and finishing machine to ride on the existing or previously constructed surface or mat of material may be required as directed by the Engineer.

[Include the following if pavement edge treatments are shown on the typical sections for unimproved roadway segments:]

Pavement edges along unimproved roadways shall be constructed in accordance with the "Pavement Edge Treatments" detail included herein at the end of this Section R. Pavement edge treatments shall be constructed monolithically with the adjacent lane or shoulder by a paving machine attachment (device) specifically designed and constructed to produce pavement beveled edges.

Shoulders shall be graded as necessary to accommodate the edge treatment. The subgrade upon which the edge treatment is to be placed shall be free of debris and vegetation, and compacted.

The device must be capable of shaping and compacting PMAC to the cross section shown on the detail. Compaction shall be obtained by constraining the asphalt concrete to reduce the cross sectional area by 10 to 15 percent. The device shall be capable of producing a uniform surface texture without tearing, shoving, or gouging, and of transitioning to. The resultant surface texture shall not contain ridges or indentations.

The angle of the slope shall not deviate by more than \pm 5 degrees from the angle shown on the detail when measured from the plane of the adjacent finished pavement surface.

If paving is done in multiple lifts, the safety edge treatment can be placed either with each lift or with the final lift.

Commercially available devices are described under "3.2 Equipment – AC Safety Edge_{SM} Devices" at the following web site:

http://www.fhwa.dot.gov/everydaycounts/technology/safetyedge/designconst/ch3.cfm #s341

[End inclusion.]

[Include 902-6.4.2 through 902-6.4.4 for QA/QC projects:]

902-6.4.2 Quality Control Program. The Contractor shall submit a "Quality Control Program for Polymer Modified Asphalt Concrete" placement in accordance with 2-5.3.4. This program shall include the name(s) of personnel responsible for quality control, their qualifications, and specific procedures to be followed during polymer modified asphalt concrete placement operations.

The Contractor shall maintain accurate records of all tests it performs as part of its Quality Control Program and shall make these records available to the Engineer upon request. The Contractor shall satisfy itself that its materials and workmanship, including those of its subcontractors and suppliers, are in conformance with the Contract Documents. The Contractor shall submit to the Engineer for review copies of the results of all Quality Control tests it has performed prior to requesting the Agency to perform Quality Assurance testing.

902-6.4.3 Test Strip. The first order of work during distribution and spreading shall be the placement of a test strip. The quantity of the test strip shall be 500 tons. The test strip shall be incorporated into the Work. The test strip shall be located such that it does not have to be opened to traffic immediately upon completion of rolling operations. The Contractor shall not open the test strip to traffic until coring has been completed and the Engineer has so approved.

[Include the following if the Agency will perform the coring:]

902-6.4.4 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 600-6.13. The Contractor shall allow 2 Working Days, beginning the next Working Day following the Day coring operations are completed, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[Include the following if the Contractor will perform the coring:]

902-6.4.4 Suspension and Resumption of Distribution and Spreading. The Contractor shall suspend distribution and spreading upon completion of the test strip. The Contractor shall not resume distribution and spreading operations until the Agency has completed its testing activities and furnished the Contractor with the information specified in 902-6.5. The Contractor shall allow 2 Working Days, beginning on the next Working Day following the Day the cores are furnished to the Engineer, for the Agency to complete the aforementioned. Suspension and resumption of distribution and spreading shall be shown as an individual activity on the Contractor's construction schedule per 6-1.

[End inclusion.]

[Include the following except for QA/QC projects:]

902-6.5 Rolling. Rolling shall conform to 302-5.6 of the SSPWC.

[Include the following for QA/QC projects:]

902-6.5 Rolling. Rolling shall conform to 302-5.6 of the SSPWC except as follows:

Replace the third paragraph of 302-5.6.2 with the following:

The Contractor shall determine the in-place density and relative compaction of polymer modified asphalt concrete placed on this Project as part of its Quality Control Program. The Contractor shall follow the procedures and methods specified in California Test 375, February 2012 (included herein at the end of this Section R) modified as follows:

PART 1. STANDARDIZATION AND CALIBRATION OF THE NUCLEAR DENSITY DEVICE IN THE BACKSCATTER MODE

B. APPARATUS

1. Replace the first sentence with the following:

The nuclear device shall be specifically designed to determine the density of asphalt concrete.

PART 2. CORRELATION WITH CORE DENSITIES

B. TEST STRIP

- 1. Add the following:
 - c. The test strip shall conform to 302-5.5. The Contractor shall notify the Engineer 24 hours prior to the placement of the test strip. The Agency's Materials Laboratory will assist the Contractor in determining the Contractor's nuclear gauge correlation value.
- 2. Add the following:

The nuclear density values shall be determined by the Contractor and furnished to the Engineer or Agency representative present during test strip operations.

3. Add the following: [Select one of the following as appropriate:]

The Agency will obtain the cores. The Contractor shall establish the traffic control necessary for the Agency to safely perform the coring operations. Traffic control shall be maintained until the Agency has completed coring operations. Upon the completion of coring operations, the Contractor shall furnish, place, and compact polymer modified asphalt concrete of the same class and grade as the test strip in the core holes.

The Contractor shall core the test strip and furnish the cores to the Engineer. Upon the completion of coring operations, the Contractor shall furnish, place, and compact polymer modified asphalt concrete of the same class and grade as the test strip in the core holes.

4. Replace with the following:

The Agency will determine the density of each core in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate.

5. Add the following:

The Agency will determine the average core density for each test site and furnish the test results to the Contractor within 2 Working Days of receipt of the cores by the Engineer.

6. Add the following:

The Agency will determine the correlation value for each test site and furnish to the Contractor.

PART 3. TEST SITE SELECTION

A. SCOPE

Add the following:

The basis of reporting test results to the Engineer shall be a Lot. A Lot shall be defined as the amount of pavement placed in 1 Day. A Sub-Lot shall be defined as 500 tons. Should the amount of pavement placed in 1 Day be less than 500 tons, the Sub-Lot and Lot shall be one and the same. Each Lot shall be from a single source unless otherwise approved by the Engineer.

B. TESTING FREQUENCY

1. Replace with the following:

The Contractor shall test a minimum of 10 sites for each 500 tons of polymer modified asphalt concrete placed.

2. Replace with the following:

For areas containing less than 500 tons, the Contractor shall test at the rate of 1 test site for each 50 tons or portion thereof of polymer modified asphalt concrete placed.

PART 4. DETERMINING IN-PLACE DENSITY BY THE NUCLEAR DENSITY DEVICE

B. APPARATUS/MATERIAL

1. Add the following:

The nuclear device shall be specifically designed for testing the density of asphalt concrete.

C. DETERMINING IN-PLACE DENSITY

Add the following:

- 13. The Contractor shall furnish the Engineer with a copy of the test results for each Sub-Lot at the end of each Working Day. The test results shall identify the Lot and Sub-Lot in the following manner:
 - 1) Each Lot shall be consecutively numbered (i.e. first day of paving, Lot "1"; second day of paving, Lot "2"; ...)

2) Each Lot shall be divided into Sub-Lots of 500 tons each and shall be consecutively lettered starting with Sub-Lot "A" (i.e. the first Sub-Lot of the first day of paving will be Lot "1-A", the second Sub-Lot of the first day of paving will be Lot "1-B"...the first Sub-Lot of the second day of paving will be Lot "2-A", ...). A Sub-Lot may, when approved by the Engineer, be placed at 2 separate locations as long as placement is in conformance with the Specifications and the Contractor clearly identifies the location and limits of the placement.

PART 5. DETERMINING TEST MAXIMUM DENSITY

A. SCOPE

Add the following:

The Agency will determine the TMD using the laboratory procedure (LTMD). The Agency may, at its option, use the field procedure (FTMD). The Agency will furnish the Contractor with the TMD to be used for the purpose of calculating relative compaction per Part 6.

PART 6. CALCULATING RELATIVE COMPACTION

Add the following:

- 4. The Agency will take a set of 3 cores per Sub-Lot for the purposes of determining in-place density. In-place density will be determined by the Agency in accordance with California Test 308, Method "A", with the exception that the Agency will use zinc stearate. The average in-place density of the 3 cores will be used for the purpose of calculating relative compaction per Part 6. The Agency, at its option, may determine the average in-place density using a nuclear device in accordance with California Test 375. In the event of a dispute between the results obtained by the Contractor using the nuclear device, and the results obtained by the Agency using California Test 308, the latter results shall prevail.
- **902-6.6 Joints.** Joints shall conform to 302-5.7 of the SSPWC. Longitudinal joints shall coincide with traffic lane lines unless otherwise approved by the Engineer.
- **902-6.7 Manholes (and Other Structures).** Manholes and other structures shall conform to 302-5.8 of the SPWWC except as follows:

Replace the first sentence of the first paragraph of 302-5.8 of the SSPWC with the following:

Sewer structures, except those owned by the County Sanitation Districts of Los Angeles County, and storm drain structures extending 2 inches or more above the new sub-grade shall be removed by the Contractor to the new sub-grade before paving.

Add the following after the first sentence of the third paragraph of 302-5.8 of the SSPWC:

Manhole frames and covers shall be cleaned prior to placement of the surface course.

Replace the second sentence of the third paragraph of 302-5.8 of the SSPWC with the following:

The Contractor shall fill the remaining 1-1/2 inches (38 mm) with asphalt concrete (D2-PG 64-10).

Add the following:

Survey Monuments will be located and marked by the Agency prior to the start of the Work. During the progress of the Work, cold millings, hot or cold mix asphalt concrete materials, and other debris shall not be deposited in survey monument wells. Each well shall be free of debris prior to adjustment. Should the monument lids be damaged prior to adjustment, the Contractor shall notify the Engineer. The Agency's Survey/Mapping and Property Management Division, Construction Surveys Section, will furnish new lids for the Contractor to install.

902-6.8 Measurement. PMAC pavement will be measured by the ton.

The Contractor shall furnish to the Engineer at the time of delivery to the Work site, a legible copy of a licensed weighmaster certificate showing gross, tare, and net weights of each truckload of PMAC. When an automatic batching system is used, the certificate may show only the net weight of PMAC in the truckload.

902-6.9 Payment. Payment for PMAC pavement will be made at Contract Unit Price per ton for "PMAC PAVEMENT" and shall include payment for tack coat and rock dust blotter.

No separate or additional payment will be made for the adjustment of survey monument lids. Payment shall be considered as included in the Contract Unit Price for "PMAC PAVEMENT."

Failure of the Contractor to provide a licensed weighmaster certificate to the Engineer by the end of the day on which the PMAC represented by such certificate was delivered to the Work site may, at the discretion of the Engineer, result in forfeiture of payment.

[Include the following for QA/QC projects:]

Payment for compaction testing shall be considered as included in the Contract Unit Price for "PMAC PAVEMENT."

[Include the following for QA/QC projects if the Agency will perform the coring:]

Payment for polymer modified asphalt concrete placed in the test strip will be made at the Contract Unit Price per ton for "PMAC PAVEMENT (TEST STRIP)." The Contract Unit Price shall also include establishing and maintaining traffic control, and furnishing, placing and compacting polymer modified asphalt concrete of the same class and grade as the test strip in the core holes.

[Include the following two provisions for QA/QC projects if the Contractor will perform the coring:]

Payment for polymer modified asphalt concrete placed in the test strip will be made at the Contract Unit Price for "PMAC PAVEMENT (TEST STRIP) (INCL CORES)."

No separate payment will be made for test strip pavement cores. Payment shall be considered as included in the Contract Unit Price for "PMAC PAVEMENT (TEST STRIP) (INCL CORES)." The Contract Unit Price shall also include extracting the cores, furnishing the cores to the Engineer, establishing and maintaining traffic control, and furnishing, placing and compacting polymer modified asphalt concrete of the same class and grade as the test strip in the core holes.

[Include the following for QA/QC projects:]

Payment for PMAC pavement in which the relative compaction, by lot, is less than 95 percent, but greater than 91.9 percent, will be made at the Contract Unit Price minus (the Reduced Compensation Factor multiplied by the Contract Unit Price) as shown in Table 902-6.9.

TABLE 902-6.9

Relative	Reduced	Relative	Reduced
Compaction	Compensation	Compaction	Compensation
•		· ·	•
(Percent)	Factor	(Percent)	Factor
95.0	0.000	93.4	0.062
94.9	0.002	93.3	0.068
94.8	0.004	93.2	0.075
94.7	0.006	93.1	0.082
94.6	0.009	93.0	0.090
94.5	0.012	92.9	0.098
94.4	0.015	92.8	0.108
94.3	0.018	92.7	0.118
94.2	0.022	92.6	0.129
94.1	0.026	92.5	0.142
94.0	0.030	92.4	0.157
93.9	0.034	92.3	0.175
93.8	0.039	92.2	0.196
93.7	0.044	92.1	0.225
93.6	0.050	92.0	0.300
93.5	0.056		_

Should the compaction of any lot be less than 91.9 percent, the lot shall be removed and replaced at the Contractor's expense.

[End inclusions.]

902-7 BONDED WEARING COURSE (BWC) (GAP-GRADED).

902-7.1 General. Bonded wearing course (BWC) shall consist of polymer modified and gap graded hot mix placed over a polymer modified asphalt emulsion membrane in a single pass using an integrated paving machine. The thickness shall be as shown on the Plans.

902-7.2 Materials.

- **902-7.2.1 General.** Materials consist of a polymer modified asphalt emulsion membrane and plant-mixed polymer modified and gap graded (PMGG) hot mix. The polymer modified asphalt emulsion used in the membrane and the polymer modified paving asphalt used in the PMGG hot mix shall both be modified using the same polymer modified technology in order to insure compatibility.
- **902-7.2.2 Polymer Modified Asphalt Emulsion.** Polymer modified asphalt emulsion for use as a polymer modified asphalt emulsion membrane shall conform to the requirements shown in Table 902-7.2.2.

Tests on Emulsion Method Min. Max. Storage Stability Test, 24 hours, % AASHTO T59 Sieve Test (on original emulsion at time of delivery), % AASHTO T59 0.05 California Test 331 Residue by Evaporation, % 63 Demulsibility, 35 ml 0.8% dioctyl sulfosuccionate AASHTO T59 40 **Tests on Residue From Evaporation** Penetration, 0.01mm @ 77° F (PG 64-28PM) AASHTO T49 70 200 Torsional Recovery, measure entire arc of recovery, at California Test 40 77° F, % 332

Table 902-7.2.2

The Contractor shall submit a Certificate of Compliance in accordance with 2-5.3 and 4-1.5. The submittal shall include test results.

902-7.2.3 Polymer Modified Gap Graded (PMGG) Hot Mix.

902-7.2.3.1 General. PMGG hot mix shall consist of a mixture of coarse aggregate, fine aggregate, and polymer modified paving asphalt produced at a central mixing plant. PMGG hot mix shall not contain reclaimed asphalt pavement.

PMGG hot mix shall conform to the 3/8 inch grading specified in 602-7.2.3.5.

902-7.2.3.2 Job Mix Formula (JMF). The Contractor shall submit in accordance with 2-5.3 a JMF for the specified mixture based on a mix design conforming to the requirements in Table 902-7.2.3.5.

902-7.2.3.3 Aggregate. Coarse aggregate (material retained above the No. 4 sieve) shall be crushed rock conforming to the requirements shown in Table 902-7.2.3.3 (A).

TABLE 902-7.2.3.3 (A)

Tests	Test Method No.	Limit
Percentage Wear	ASTM C131	
100 Revolutions		12 max.
500 Revolutions		35 max.
Flat & Elongated Ratio (% max. @ 3:1)	ASTM D4791	25
Sand Equivalent	CT 217	47 min.

In addition to the requirements shown in Table 902-7.2.3.3 (A), fine aggregate (material passing the No. 4 sieve and retained on the No. 8 sieve), shall conform to the requirements in Table 902-7.2.3.3 (B).

TABLE 902-7.2.3.3 (B)

Tests	Method	Limit
% Crushed, 1 or more fractured faces	CT 205	85 min.

902-7.2.3.4 Polymer Modified Paving Asphalt. Polymer modified paving asphalt shall be PG 64-28PM conforming to the requirements of Table 902-7.2.3.4.

TABLE 902-7.2.3.4

	AASHTO Test		ication ade
Property	Method	PG 64-28PM	PG 76-22PM
	Original Binde	er	•
Flash Point, Minimum °C	T 48	230	230
Solubility, Minimum % ^b	T 44 ^c	98.5	98.5
Viscosity at 135°C, d	T 316		
Maximum, Pa [·] s		3.0	3.0
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		64	76
Minimum G*/sin(delta), kPa		1.00	1.00
RTFO Test,	T 240		
Mass Loss, Maximum, %		1.00	1.00
	RTFO Test Aged B	Binder	
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		64	76
Minimum G*/sin(delta), kPa		2.20	2.20
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		Note e	Note e
Maximum (delta), %		80	80
Elastic Recovery ^t ,	T 301		
Test Temp., °C		25	25
Minimum recovery, %		75	65
PAV ⁹ Aging,	R 28		
Temperature, °C		100	110
RTFO Test and PAV Aged Binder			
Dynamic Shear,	T 315		
Test Temp. at 10 rad/s, °C		22	31
Maximum G*sin(delta), kPa		5000	5000
Creep Stiffness,	T 313		
Test Temperature, °C		-18	-12
Maximum S-value, MPa		300	300
Minimum M-value		0.300	0.300

Notes:

- a. Do not modify polymer modified paving asphalt using acid modification.
- b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Caltrans' "Certification Program for Suppliers of Asphalt."
- c. ASTM D5546 is allowed instead of AASHTO T 44
- d. The Engineer waives this specification if the supplier certifies the paving asphalt can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The Engineer will accept direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
- f. Tests without a force ductility clamp may be performed.
- g. "PAV" means pressurized aging vessel.

902-7.2.3.5 Composition and Grading. The grading of the combined aggregates and the percentage of polymer modified paving asphalt shall conform to the requirements in Table 902-7.2.3.5. The percentages shown are based on the weight of dry aggregate only (outside).

TABLE 902-7.2.3.5

3/8" Polymer Modified Gap Graded Hot Mix			
	Percentage Passing Sieves		
Sieve Size	Sieve Size Target Value(TV) Allowal Limits Toleran		
1/2"	100	-	
3/8"	80 – 100	TV +/- 6	
#4	25 - 40	TV +/- 7	
#8	19 – 32	TV +/- 5	
#16	16 - 22	TV +/- 5	
#30	10 – 18	TV +/- 4	
#50	8 – 13	TV +/- 4	
#100	6 – 10	TV +/- 2	
#200	4 - 7	TV +/- 2	
Paving Asphalt, %*	5.2 - 7.0	TV +/- 0.3	
Film Thickness, µm*	10.0 mi	10.0 min	
Notes:			

^{*} Film thickness is as follows:

PMGG Hot Mix for Job Mix Formula

Quality Characteristic	Test Method	Requirement
Film thickness, (µm min.)	Asphalt Institute MS-2 Table 6.1 Note a	10.0
Drain Down (max.)	AASHTO T-305 ^b	0.1%

Notes

^a Film thickness is calculated based on effective asphalt content and determined as follows:

$$FT = \left(\frac{P_{be}}{SA \times G_b \times 1000}\right) 10^6$$

where:

FT = Film Thickness in μ m

P_{be} = Effective asphalt content by weight of aggregate using Caltrans Lab Procedure LP-4.

SA = Estimated surface area of the aggregate blend in m²/kg from Table 6.1 in the Asphalt Institute Manual Series No. 2 (MS-2).

G_b = Specific gravity of asphalt binder

^b Combine aggregate and paving asphalt at the supplier's recommended mixing temperature. Coated aggregates that fall through the wire basket during loading will not be considered as "drain down" and are returned to the basket before conditioning at 350°F for one hour.

The optimum binder content (OBC) must be greater than 5.2 percent by weight of dry aggregate.

Voids in mineral aggregate (VMA), voids filled with asphalt, dust proportion, and stabilometer value are not required for the JMF.

The mixture shall not contain reclaimed asphalt pavement (RAP).

- **902-7.2.3.6 Aggregate Storing, Drying and Screening.** Aggregate storing, drying, and screening shall conform to 203-6.5.
 - **902-7.2.3.7 Proportioning.** Proportioning shall conform to 203-6.6.
- **902-7.2.3.8 Mixing.** Mixing shall conform to 203-6.7 except the second and third sentences of the first paragraph of 203-6.7.1. Replace the second and third sentences of the first paragraph of 203-6.7.1 with the following:

Aggregate temperature shall not exceed 350°F when mixed with paving asphalt. For the drier-drum method, the temperature of the completed mixture shall not exceed 350°F.

- **902-7.2.3.9 Storage.** Storage shall conform to 203-6.8. Storage time shall not exceed 8 hours.
- **902-7.2.3.10 Miscellaneous Requirements.** Miscellaneous requirements shall be as specified in the third through fifth paragraphs of 203-6.9.

902-7.3 Placement Equipment.

- **902-7.3.1 General.** Placement equipment shall be approved by the Engineer. The Contractor shall furnish and operate an integral paving machine while placing BWC. The use of conventional paving machines will not be allowed.
- **902-7.3.2 Material Transfer Vehicle (MTV).** The MTV shall be a self-propelled, rubber-tired or track vehicle capable of receiving paving material from end-dump trucks, re-mixing the paving material, and depositing the paving material directly into the hopper of the integrated paving machine via a closed and insulated conveyor system. The MTV shall be a Roadtec Shuttle Buggy MTV, or Terex CR662RM RoadMix.
- **902-7.3.3 Integrated Paving Machine.** The integrated paving machine (machine) shall be capable of spraying the polymer modified asphalt emulsion, applying the polymer modified gap graded hot mix and providing a smooth surface to the mat in one pass at the rate of 66 feet/minute or greater. No wheel or other part of the machine shall come in contact with the polymer modified asphalt emulsion membrane before the polymer modified gap graded hot mix is applied.

Integrated paving machines shall be equipped with the following:

- a) a receiving hopper with a minimum of 2 heated twin screw feed augers,
- b) an integral storage tank for polymer modified asphalt emulsion membrane,
- twin expandable polymer modified asphalt emulsion membrane spray bars located immediately in front of the asphalt spread augers and combination vibratorytamping bar screed,
- d) a variable width vibratory heated tamping bar screed. The screed shall have the ability to crown the pavement at the center both positively and negatively and have vertically adjustable extension to accommodate the desired pavement profile, and
- e) a fully automatic screed control system which shall be in operation at all times. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30-feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material. A joint maker placed on the side of the spreading and finishing machine to ride on the existing or previously constructed surface or mat of material may be required as directed by the Engineer.

The integral paving machine shall be a Roadtec SP-200, or Vogele Super 1800-2 with the Spray Jet Module.

- **902-7.3.4 Rollers.** Rollers shall be steel wheel rollers weighing between 126 and 172 pounds per linear inch of drum width equipped with an operating water spray and scraper system.
- **902-7.3.5 Trucks.** Trucks used for transporting polymer modified gap-graded hot mix shall be end dumps, insulated live bottom, or tractors pulling insulated live bottom trailers. Bottom dump trucks will not be allowed. If end dumps are used, they shall be so configured as not to allow any of the materials to be distributed outside of the integrated paving machine's receiving hopper. The use of windrow pick-up machines will not be allowed.

902-7.4 Placement.

902-7.4.1 General. BWC shall not be placed on wet pavement. The roadway pavement surface temperature shall be not less than 50°F at the time of placement.

BWC shall first be placed in left turn pockets and other non-symmetrical width areas such that the remaining roadway width is uniform.

The Contractor shall submit a BWC placement plan to the Engineer at the pre-paving conference. The placement plan shall be an annotated copy of the Project Plans denoting the Contractor's intended sequence and widths of placement and the location of proposed longitudinal joints.

PMGG hot mix shall be deposited into the material transfer vehicle. Direct deposit into the integral paving machine will not be allowed.

- **902-7.4.2 Pre-Paving Conference.** A minimum of 5 Working Days prior to the scheduled start of BWC placement, the Engineer will arrange a meeting with the Contractor's Representative, the Contractor's paving foreman, materials suppliers, and representatives of the Agency's Materials Laboratory. The following will be discussed:
 - a) BWC placement plan.
 - b) Equipment.
 - c) Rate of delivery/placement.
 - d) Agency plant inspection.
 - e) Traffic control.
 - f) Other topics as may be proposed.
- **902-7.4.4 Surface Preparation.** Prior to the application of the polymer modified asphalt emulsion membrane, the existing roadway pavement shall be prepared as follows:
 - a) Digouts and other pavement replacement work shown on the Plans shall be completed a minimum of 2 weeks prior to application of the BWC.
 - b) Manhole covers, drains, grates, catch basins, and other such utility structures shall be protected and covered with plastic or building paper and also shall be clearly referenced for location and adjustment after paving.
 - c) Thermoplastic traffic markings shall be removed.
 - d) The entire roadway pavement surface to be resurfaced shall be thoroughly cleaned, giving specific attention to accumulated mud and debris. Pressurized water and/or vacuum systems may be required to ensure a clean surface.
- **902-7.4.5** Polymer Modified Asphalt Emulsion Membrane. The spray-applied polymer modified asphalt emulsion forms a membrane which becomes part of the BWC. The polymer modified asphalt emulsion membrane bonds the polymer modified and gap graded hot mix to the existing roadway surface and creates a water-impermeable seal.

Polymer modified asphalt emulsion shall be applied by a metered, mechanical pressurized spray bar at a temperature of 140-180°F. The integrated paving machine shall accurately and continuously monitor the rate of application. The application shall be uniform across the entire width of the existing roadway pavement surface to which it is being applied.

The rate of application shall be 0.2 +/- 0.03 gallons per square yard as determined by the mix design and recommended by the materials supplier, with necessary adjustments for the existing roadway surface condition as approved by the Engineer. The application rate shall be such that the polymer modified emulsion membrane does not flush to and remain at the surface of the polymer modified gap-graded hot mix. No wheel or other part of the integrated paving machine shall come in contact with the polymer modified asphalt emulsion membrane before the polymer modified gap graded hot mix is placed.

- **902-7.4.6 Polymer Modified Gap-Graded (PMGG) Hot Mix.** PMGG hot mix shall be placed using the material transfer vehicle specified in 902-7.3.2 and the integral paving machine specified in 902-7.3.3 as follows:
 - a) at a mixture temperature of 300°F 330°F,
 - b) with the heated, combination vibratory-tamping bar screed in operation,
 - c) over the full-width of the polymer modified asphalt emulsion membrane within 5 seconds after application of the membrane, and
 - d) at the thickness specified on the Plans.

In no case shall the application rate be low enough to allow fracturing or dragging of the top size aggregate by the screed.

PMGG hot mix shall be deposited into the hopper of the material transfer vehicle. The MTV shall convey the PMGG hot mix to the hopper of the integral paving machine. Direct deposit into the hopper of the integral paving machine will not be allowed.

The MTV and integral paving machine shall place the PMGG hot mix in a continuous, uninterrupted operation.

- **902-7.4.7 Joints.** Joints shall be vertical. Transverse joints shall be constructed at right angles to the direction of travel delineated by traffic lane lines. Longitudinal joints shall be coincidental with traffic lane lines. Lapped joints will not be permitted. The paving width may extend to the middle of the adjacent traffic lane if so approved by the Engineer. Longitudinal joints shall be delineated on the BWC placement plan specified in 902-7.4.1.
- **902-7.4.8 Rolling.** The number of rollers in operation shall be that which is sufficient to match placement production and achieve conformance with the Specifications, but shall be a minimum of 2. One additional roller shall be present on the Work site and in operational condition should a replacement be needed.

Rolling shall commence immediately after placement of the BWC. The first pass shall be performed before the mat temperature falls below 240°F.

Rolling shall be completed before the mat has cooled to 180°F. A minimum of 2 complete roller passes over the polymer modified gap graded hot mix is required. One pass is considered as both forward and backward rolling over the same path. Each pass shall overlap the previous pass by approximately one-half the width of the roller. Rolling shall be performed in such a manner that no ridges result from directional changes. Rollers shall not be left stationary on the mat.

- **902-7.4.9 Traffic Readiness.** Traffic readiness is the time at which BWC can support straight rolling traffic without damage to the mat. BWC shall not be opened to traffic until rolling operations are complete and the material has cooled sufficiently to resist damage.
- **902-7.4.10 Measurement.** BWC will be measured by the ton of PMGG hot mix placed in conformance with the Plans and Specifications. Polymer modified asphalt emulsion will not be measured separately for payment.

The Contractor shall furnish to the Engineer at the time of delivery to the Work site, a legible copy of a licensed weighmaster's certificate showing gross, tare, and net weights of each truckload of PMGG hot mix. When an automatic batching system is used, the certificate may show only the net weight of PMGG hot mix in the truckload.

902-7.4.11 Payment. Payment for BWC will be made at the Contract Unit Price per ton for "BONDED WEARING COURSE (GAP-GRADED)." Payment shall include full compensation for surface preparation, polymer modified asphalt emulsion membrane, polymer modified and gap graded hot mix, and other appurtenant work not included as a separate Bid item.

Failure of the Contractor to provide a licensed weighmaster certificate to the Engineer by the end of the day on which the PMGG hot mix represented by such certificate was delivered to the Work site may, at the discretion of the Engineer, result in the forfeiture of payment.

SECTION 903 - RECYCLED ASPHALT CONCRETE

903-1 COLD-IN-PLACE RECYCLED APHALT CONCRETE PAVEMENT (CIRACP).

- **903-1.1 General.** CIRACP shall consist of 100 percent reclaimed asphalt pavement (RAP), emulsified recycling agent, and other additives uniformly mixed, spread, compacted, finished, and cured in such a manner that the in-place mixture forms a dense, uniform mass conforming to the lines, grades, and cross sections shown on the Plans.
- **903-1.2 Submittals.** The Contractor shall submit the following in accordance with 2-5.3:
 - a) CIRACP mix design (job mix formula). [Include only if the Contractor prepares the mix design.]

- b) Two, 2-quart samples of emulsified recycling agent to the Engineer with the CIRACP mix design submittal. [Include only if the Contractor prepares the mix design.]
- c) Quality Control Plan per 903-1.6.2.

The Contractor shall submit the following to the Engineer during production and placement:

- d) Test results and Certificates of Compliance conforming to 4-1.5 of the SSPWC for the emulsified recycling agent and each additive with each delivery to the Work site. Test results may represent a batch or a Day of production. An AASHTOaccredited laboratory shall perform the testing.
- e) Certified weighmaster certificates showing the net weight of each load of emulsified recycling agent, additives, emulsified asphalt (fog seal coat), and sand (sand cover) delivered to the Work site.
- f) On a daily basis during cold-in-place recycling operations, the Contractor shall submit:
 - i) Quality control inspection records, sampling and test results.
 - ii) One, 2-quart sample of emulsified recycling agent from each load delivered to the Work site no later than 1 hour after samples are taken.
 - iii) Batch logs for cement or lime slurry production.
 - iv) Dilution data for emulsified asphalt.
- g) During supplemental compaction of the CIRACP surface, quality control inspection records, and sampling and test results.

903-1.3 Materials.

- **903-1.3.1 General.** Materials include RAP generated from cold milling the asphalt concrete pavement to be recycled, emulsified recycling agent, additive, and water.
- **903-1.3.2** Reclaimed Asphalt Pavement (RAP). RAP shall be produced by cold milling the existing asphalt concrete pavement on roadways within the limits of the Work. RAP shall be crushed and screened in accordance with 903-1.8.5.
- **903-1.3.3 Emulsified Recycling Agent.** Emulsified recycling agent shall conform to the requirements shown in Table 903-1.3.3 (A).

Table 903-1.3.3 (A): Emulsified Recycling Agent

, ,			
		Requirement	
	Test Method	Minimum	Maximum
Tests on Emulsion:			
Sieve test, % of weight sample	AASHTO T59 1		0.1
Residue by distillation, %	AASHTO T59 1	60	
Rap Coating Test (min.)	AASHTO T59 ²	G	ood
Tests on Residue by Distillation:			
Penetration at 25°C, 100g / 5 sec (TV)	AASHTO T49 2,4	TV +/- 2	5 percent ³
(min.)			
Absolute Viscosity at 60°C,	AASHTO T2171	Pone	ort Only
pascal second (x10 ⁻¹) (TV) ⁴	AASHTO 12171	Керс	ort Offig

Notes:

- 1. Modify AASHTO T 59 distillation temperature of 350°F with a 20-minute hold.
- 2. CIR mixture emulsified recycling agent and water application rates to be determined using Work site RAP in CIR mix design and submitted in the job mix formula.
- 3. Target value (TV) is determined for emulsified recycling agent chosen for use and submitted in the job mix formula.
- 4. Sieve residue from distillation on No. 20 sieve before determining viscosity.

Paving asphalt used to make the emulsified recycling agent shall conform to 203-1 of the SSPWC.

At the Contractor's option, the emulsified recycling agent may contain a latex polymer and/or a rejuvenating agent. The latex polymer shall conform to the requirements shown in Table 903-1.3.3 (B). The rejuvenating agent shall conform to the requirements shown in Table 903-1.3.3 (C).

Table 903-1.3.3 (B): Latex Polymer

Test on Latex Polymer	Test Method	Requirement
Specific Gravity, min.	ASTM 1475	1.08
Tensile strength, die C dumbbell, psi, min.	ASTM D412 ⁵	500
Swelling in rejuvenating agent, % max. 48 hours exposure	ASTM D471 ⁶	40%
@ 104°F	Modified	intact film

Notes:

- 5. Tensile Strength Determination: Samples for testing for tensile strength in accordance with ASTM D412 shall be cut using a die dumbbell at a crosshead speed of 20 inches/min.
- 6. Latex Testing: Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section. Polymer film shall be prepared from latex as follows:

Resistance to Swelling: Polymer films shall be formed by using a 50 mil drawdown bar and drawing down 50 mils of the latex on polyethylene boards. Films shall be cured for 14 days at 75°F and 50% humidity. Samples for resistance to swelling in rejuvenating agent shall be 1" by 2" rectangles cut from the cured film. Cut at least 3 specimens for each sample to be tested for swelling. Fill 3-8 oz ointment tins with at least a ½" deep of rejuvenating agent. Swelling samples shall be weighed and then placed in the ointment tins on top of the rejuvenating agent. Then, add at least another ½" deep of rejuvenating agent over each of the latex samples. The ointment tins shall be covered and placed in an oven at 104°F for the specified 48 hours +/- 15 minutes. The ointment tins are allowed to cool to 75°F and then the latex films are removed from the tins. Unabsorbed rejuvenating agent is removed from the intact latex film by scraping with a rubber policeman and blotting with paper towels. If the latex film does not remain intact during removal from the tins or while removing the unabsorbed rejuvenating agent the sample shall be rejected. After the rejuvenating agent is removed from the samples they are then weighed. Percent swelling is reported as weight increase of the polymer film; report mass increase as a percent by weight of the original latex film mass upon exposure of films to the recycling agent.

Table 903-1.3.3 (C): Rejuvenating Agent

Test on Rejuvenating Agent	Test Method	Requirement
Viscosity, 140 °F, CST	ASTM D2170	50-175
Flash Point, °F, COC	ASTM D92	380 Min.
Saturate, % by weight	ASTM D2006-70	30 Max.
Asphaltenes	ASTM D2872	1.0 Max.
Test on Residue		
Weight Change, %	ASTM D2872	6.5 Max.
Viscosity Ratio	ASTM D2170	3 Max.

- **903-1.3.4 Water.** Water added shall be potable, clean, and free of deleterious concentrations of acids, alkalis, salts, sugar and other organic or chemical substances.
- **903-1.3.5** Additive. The additives, if so specified in the approved mix design, shall be Type II Portland cement or lime. Portland cement shall conform to 201-1.2.1 of the SSPWC.

Lime shall conform to the chemical requirements in ASTM C977 except it shall have a minimum of 90 percent available calcium oxide. Hydrated lime (dry or slurry), air slaked, by-product or waste lime is not permitted and will be rejected. Quicklime shall be supplied from a single source, protected from moisture until application, and sufficiently dry to flow freely when handled. Lime slurry shall be produced at the Work site.

The additive shall be incorporated into the CIRACP mix as determined by the CIRACP mix design.

- **903-1.3.6 Emulsified Asphalt.** Emulsified asphalt for fog seal coat shall be CSS-1h or CQS-1h conforming to 203-3 of the SSPWC.
 - **903-1.3.7 Sand.** Sand for sand cover shall conform to 200-1.5.3 of the SSPWC.

903-1.4 Mix Design.

[Include the following if the Agency has prepared the mix design:]

The Agency has prepared the mix design for this Contract. The mix design will be furnished to the Contractor. *The emulsified recycling agent percentage, by dry weight of RAP, shall be _ percent.*

[End inclusion.]

[Include 903-1.4.1, 903-1.4.2, and 903-1.4.3 if the Contractor is required to prepare the mix design.]

903-1.4.1 General. The Contractor shall submit a mix design(s) in accordance with 2-5.3 and 903-1.2. The mix design(s) shall be prepared by a Caltrans certified testing laboratory, and be signed and stamped by a State of California Registered Civil Engineer. The component materials used in the mix design(s) must be the same materials that will be used during CIRACP production and placement.

Based on the characteristics of the RAP taken from the Work site, more than one mix design may be required.

The CIRACP mixture shall conform to the requirements shown in Table 903-1.4.1.

Table 903-1.4.1 CIRACP Mixture Design Requirements

Table 500 114.1 Olivator mixture besign requirements		
Quality Characteristic/Test Method	Requirement	
Gradation of Reclaimed Asphalt Pavement (RAP): CT 202	Passing 1-inch	
Asphalt Content of RAP: CT 362 or CT 379 or ASTM D 2172	Report	
Method B		
Bulk Specific Gravity of Compacted Samples ^{1, 2} : CT 308, Method C	Report	
Maximum Theoretical Specific Gravity ² : CT 309, including provisions	Report	
of Section J	Report	
Air Voids of Compacted and Cured Specimens ² : CT 367, Part B	Report	
Marshall Stability, Cured Specimen ² : AASHTO T 245, 104 °F (min.)	1250 lb	
Marshall Retained Stability, AASHTO T 245, 104 °F based on	70% 4	
Moisture Conditioning on Cured Specimen (min.) ^{2, 3}	1078	
Ratio of Emulsion Residue to Cement (min.)	3.1	
Raveling Test of Cold Mixed Bituminous Emulsion, ASTM D 7196,	7.0%	
50 °F (max.)	1.078	
RAP Coating Test, ASSHTO T59 ⁵ , (min.)	Good	

Notes:

- 1. 4-inch diameter mold compaction based on either 75 blow Marshall on each side or gyratory compactor at 30 gyrations.
- 2. Test specimens after 140°F curing to constant weight between 16 hours and 48 hours.
- 3. Vacuum saturation from 55 percent to 75 percent. Water bath at 77 °F for 23 hours, with the last 30 minutes to 40 minutes in 104 °F water bath.
- 4. The Marshal Retained Stability ratio may be reduced to 60%, providing the saturated Marshall Stability is at least 1500 lbs.
- 5. Modify ASSHTO T59 using jobsite RAP, emulsified recycling agent and water application rates that have been determined in the CIR mix design and submitted in job mix formula.

During preparation of the mix design, the Contractor shall determine the target values for penetration at 77°F and viscosity at 140°F of the emulsified recycling agent to be used in the production of the CIRACP mixture. The Contractor shall provide current test results for the emulsified recycling agent and additives at the time of the mix design.

903-1.4.2 Emulsified Recycling Agent Percentage.

- **903-1.4.2.1 General.** This procedure is used to determine the percent and grade of the emulsified recycling agent to be used when constructing CIRACP.
- **903-1.4.2.2 Core Samples.** A representative baseline of core samples for use in the mix design(s) shall be taken from the existing pavement at the Work site. A minimum of one core shall be obtained for each 1/2 lane-mile, and where visual differences in the pavement type or structural section occur. Cores shall be cut to the thickness shown on the Plans for CIRACP.

When core samples indicate significant variation in type or thickness of existing pavement courses, separate mix designs shall be developed for each common pavement type segment.

A minimum of 350 pounds of RAP shall be obtained from the Work site for use in determining the mix design(s). A representative sample of each common pavement type shall be tested in accordance with California Test 362, California Test 379, or California Test 382 to determine the asphalt content of the RAP.

Two mix designs shall be developed for each gradation shown in Table 903-1.4.2.2 below by recombining the RAP material.

17(222 000 1111212			
Sieve Size	Target Value (Percent Passing)		
	Medium Gradation	Coarse gradation	
1"	100	100	
3/4"	95 ± 2	85 ± 2	
No. 4	50 ± 2	40 ± 2	
No. 30	10 ± 2	5 ± 2	
No. 200	0.8 ± 0.3	0.3 ± 0.3	

TABLE 903-1.4.2.2

Gradation of the RAP after milling or crushing will be determined by California Test 202 with the exception that drying of RAP samples to constant mass shall be performed at 104 ± 4 °F.

- **903-1.4.2.3 Mixing Specimen Size.** The Contractor shall determine the amount of RAP necessary to produce a 2.5 ± 0.1 inch tall specimen when compacted in accordance with 903-1.4.2.5.
- **903-1.4.2.4 Number of Specimens.** The Contractor shall select 3 emulsified recycling agent values bracketing the estimated recommended emulsified recycling agent content for the stability tests. The 3 values, in either 0.5 percent or 1.0 percent increments, shall cover a range between 0.5 percent and 4.0 percent by dry weight of RAP.

For stability testing 6 samples shall be compacted at each emulsified recycling agent value, 3 for Marshall stability on cured samples, and 3 for Marshall stability on cured samples for moisture conditioning.

Two specimens shall be used to determine the theoretical maximum specific gravity in accordance with California Test 309, Section J, with the exception that the loose RAP mixture shall by cured in an oven at $140 \pm 2^{\circ}F$ to constant weight (0.05 percent change in weight in 2 hours) for not less than 16 hours and not more than 48 hours. Any agglomerates which will not easily reduce with a flexible spatula shall be left unbroken. Both specimens shall be tested at the highest emulsified recycling agent content in the design, and the lower emulsified recycling agent values shall be back calculated.

Moisture shall be added at a rate expected to match that at the milling head, typically between 1.5 to 2.5 percent.

Additives, if used, shall be incorporated in a manner to emulate field production.

Mixing of test specimens shall be performed manually, with a mechanical bucket mixer, or by a combination of the two. RAP shall first be thoroughly mixed with water, then with emulsified recycling agent, one specimen at a time, at an ambient temperature of 77 ± 4 °F. The mixing time with emulsified recycling agent shall not exceed 60 seconds.

903-1.4.2.5 Compaction of Specimens. Specimens shall be compacted after mixing at an ambient temperature of 77 ± 4 °F.

For stability testing purposes specimens shall be compacted in 4-inch molds with a Marshall compactor by applying 75 blows per side or with a gyratory compactor at 30 gyrations.

Molds and test equipment shall remain unheated.

Paper disks, when used, shall be placed on the top and bottom of the specimen before compaction, and removed immediately after compaction.

Specimens shall be removed from molds after compaction without damage to the samples.

903-1.4.2.6 Curing Specimens after Compaction. Specimens shall be placed in a $140 \pm 7^{\circ}$ F forced draft oven with ventilation on the top and sides. Each specimen shall be placed in a small container to account for material loss.

Compacted specimens shall be cured at $140 \pm 2^{\circ}F$ to constant weight (< 0.05 percent change in weight in 2 hours), but for no more than 48 hours and no less than 16 hours. After curing, specimens shall be cooled at ambient temperature for a minimum of 12 hours and a maximum of 24 hours.

The same oven conditioning and volumetric measurements on moisture-conditioned specimens shall be used as on other specimens.

Moisture conditioning shall be performed on 3 compacted samples at each emulsified recycling agent content value by applying a vacuum of 10 to 26 inches of mercury (Hg) partial pressure for a sufficient duration to vacuum saturate samples to 55 to 75 percent. Saturation shall be calculated by comparing saturated surface mass with dry mass in air. Moisture conditioned samples shall be soaked in a 77 \pm 2°F water bath for a minimum of 22 hours and a maximum of 24 hours, followed by a 30 to 40 minute soak at 140 \pm 2°F.

903-1.4.2.7 Measurements. Asphalt content of the RAP shall be determined in accordance with California Test 362, California Test 379, or California Test 382.

Bulk specific gravity shall be determined on each compacted, cured, and cooled specimen in accordance with California Test 308, Method C.

Specimen heights shall be determined in accordance with California Test 308 Section D2e. Alternatively, the height can be obtained from the SGC readout if the gyratory compactor is used.

Maximum theoretical specific gravity shall be determined by California Test 309, Section J, with the exception specified in 903-1.4.2.4.

Air voids of the compacted and oven-cured samples of each emulsified recycling agent content value shall be determined in accordance with California Test 367, Part B.

Corrected Marshall stability shall be determined by AASHTO T245 at 140 \pm 2°F after 2 hour temperature conditioning in a forced draft oven or immersion in a water bath for 30 to 40 minutes. This test shall be performed at the same time as testing of the moisture-conditioned specimens.

- **903-1.4.2.8 Marshall Retained Stability.** The average moisture conditioned specimen strength divided by the average dry specimen strength is defined as retained stability.
- **903-1.4.2.9 Raveling Test on Recycled Asphalt Specimens.** Raveling percentage shall be determined in accordance with ASTM D7196.
- **903-1.4.3 Mix Design Submittal.** The CIRACP mix design shall include the following:
 - a) All test results conducted to achieve compliance with the CIRACP mixture design requirements.
 - b) Gradations of RAP used in lab procedure.
 - Recommended quantity of emulsified recycling agent as a percentage by weight of dry RAP for each gradation used in lab procedure.

- d) Recommended water content range as a percent of dry RAP for each gradation used in lab procedure.
- e) Recommended quantity of the additive (if used) as a percentage by weight of dry RAP for each gradation.
- f) Compaction apparatus used to form the Marshall test specimens.
- g) Target values for the emulsified recycling agent used in the CIR mixture for Penetration at 77°F and Viscosity at 140°F.
- h) For the emulsified recycling agent and the additive (if used), the following shall be provided:
 - i) Designation or product name
 - ii) Company name and location of manufacture
 - iii) Residue content for emulsified recycling agent
 - iv) Certificates of compliance with test results,
- i) Process for incorporating the additive (if used).
- j) Preliminary estimates of the time intervals between CIRACP mixing and compaction relative to ambient temperature.

[End Contractor-prepared mix design inclusion.]

903-1.5 Equipment.

- **903-1.5.1 General.** The Contractor shall use a recycling train, designed and built specifically for the purpose of producing and constructing CIRACP utilizing the in-situ asphalt concrete pavement. The recycling equipment train shall be composed of the following.
- **903-1.5.2 Cold Milling Machine.** The cold milling machine shall conform to 302-1.2 except the cutting drum shall be a minimum of 12 feet wide; and the machine shall be equipped with automatic depth and cross slope controls and capable of maintaining the cutting depth to within 1/4 inch of the depth shown on the Plans.
- **903-1.5.3 Crushing and Screening Equipment.** Crushing and screening equipment shall be capable of producing RAP of the specified size (1 inch minus) before mixing with the emulsified recycling agent, and of routing all oversize material through the crusher and re-screening to the specified size.

903-1.5.4 Mixing and Proportioning Unit.

903-1.5.4.1 General. The mixing and proportioning unit shall be calibrated in accordance with California Test 109 such that it dispenses the required quantities of emulsified recycling agent, water, and recycling additives to produce a homogenous mixture of thoroughly and uniformly coated RAP of unchanging appearance.

- **903-1.5.4.2 Pugmill.** The pugmill shall be continuous with an integrated microprocessor control system to control the weight of RAP being delivered to the mixing chamber; have automatic controls; be equipped with paddles of a type and arrangement to provide sufficient mixing and movement of RAP, emulsified recycling agent, and additives; and be configured such that no build-up of fines or other segregated material develops, and all ingredients entering at the feed end of the mixing chamber exit uniformly at the discharge end without clumping or resulting in a non-uniform mix.
- **903-1.5.5 Water Storage and Supply Equipment.** Water storage and supply equipment shall serve as an independent, supplemental water source separate from the source of water for the cold milling machine. The supplemental water system shall be interlocked with the RAP control microprocessor. The water source for the emulsified recycling agent shall be independent of the cement or lime slurry.
- **903-1.5.6 Cement or Lime Storage and Supply Equipment.** Cement or lime storage and supply equipment shall be equipped with agitators capable of keeping the cement or lime in suspension during transport or when held in the slurry feed tank. Cement and lime slurry shall be added directly to the pugmill or sprayed over the cold milling machine cutting teeth.
- **903-1.5.7 Distribution and Spreading.** Distribution and spreading equipment shall be performed by operation of a self-propelled, track-equipped spreading and finishing machine ("track paver") conforming to 302-5.5 of the SSPWC equipped with a fully automatic screed control system, and coupled to a windrow pickup machine.

The automatic screed control system shall be in operation at all times during placement. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30-feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, and placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material.

The integral track paver/windrow pickup machine shall be capable of forward progress at a rate consistent with that of the windrow of CIRACP mixture produced by the pugmill; completely picking up the windrow of mixture; and conveying and depositing the mixture directly into hopper of the spreading and finishing machine,

903-1.5.8 Rollers. Rollers shall conform to 302-5.6 of the SSPWC. A minimum of one pneumatic-tired roller weighing 25 tons and one vibratory, double steel drum roller weighing at least 10 tons shall be on the Work site and operated during placement. Rollers shall not be less than 5-1/2 feet wide. Each roller shall have a working water spray system and working scrapers. The number of rollers used shall be consistent with the rate of CIRACP material being processed and placed.

903-1.6 Quality Control Program.

- **903-1.6.1 General.** The Contractor shall implement a quality control program throughout the production and placement of CIRACP. The quality control program shall consist of the preparation and implementation of a Quality Control Plan.
- **903-1.6.2 Quality Control Plan (QCP).** The QCP shall prepare and submit in accordance with 2-5.3 and 9-1.2 a QCP which includes the following:
 - a) Name(s) of personnel responsible for quality control and their qualifications.
 - b) Name(s) and qualifications of the independent testing laboratory and staff personnel to be assigned.
 - c) Specific procedures to be following during CIRACP placement and production.
 - d) The organization, responsible parties, and procedures to address quality control issues, the conditions when corrective actions are needed, and implementation of corrective actions when required.
 - e) The inspection, sampling, testing, and reporting requirements specified in 903-1.6.3.
 - f) A contingency plan for actions that will be taken to ensure that the Work site will be opened to traffic at the end of each Working Day or at the scheduled or specified time of re-opening.
 - g) Equipment list, including manufacturer, model, and evidence of compliance with the requirements of 903-1.5.

The QCP shall include a contingency plan describing corrective actions to be taken in the event of equipment breakdown or other delays. Corrective actions shall include repairing the roadway using hot mix asphalt concrete pavement in accordance with 302-5 of the SSPWC and reopening the roadway to traffic at the end of normal working hours. Hot mix asphalt concrete pavement, when required, shall be C2-PG 64-10 conforming to 203-6 of the SSPWC.

The QCP shall contain copies of the forms that will be used to provide all required inspection records and sampling and testing results.

The Contractor shall provide an independent testing laboratory and personnel to perform quality control inspection, sampling, and testing. The testing laboratory and its personnel must be certified by Caltrans. The Engineer shall have unrestricted access to all information resulting from CIRACP mix design and quality control inspection, sampling, and testing activities.

The Quality Control Plan must be approved by the Agency prior to the start of CIRACP production and placement.

903-1.6.6 Inspection, Sampling, Testing, and Reporting. The Contractor shall perform quality control inspection, sampling, testing, and reporting as part of its Quality Control Program. The basis of reporting to the Engineer shall be a Lot. A Lot shall be defined as 3,000 square yards or fraction thereof of CIRACP constructed during the same Day. The CIRACP mix design information shall be included on the form used to record and report the quality control measurements and calculations.

For each Lot, the Contractor shall measure or calculate, record, and report to the Engineer each Day the following:

- a) The actual recycle depth at each end of the milling drum at least once every 300 feet along the cut length.
- b) Length, width, depth of cut and calculated weight in tons of material processed.
- c) Weight of emulsified recycling agent added in tons.
- d) Percentage of added emulsified recycling agent by weight of the CIRACP mixture. The amount of emulsified recycling agent shall be within 0.5 percent of the value established in the CIRACP mix design. The percent shall be determined based on the ratio of emulsified recycling agent used to the theoretical dry weight of the RAP processed.
- e) Maximum particle size of the sized RAP prior to the addition of the emulsified recycling agent. If the RAP does not meet the allowable maximum particle size, the test results shall be reported immediately to the Engineer. Re-process the material or take other corrective actions to attain conformance.
- f) Wet field gradation test results for material passing the 1 inch through No. 4 sieves on the first and every fourth sample. Compare the sieved sample to the gradation band determined from the CIRACP mix design and adjust the emulsified recycling agent as needed.
- g) Maximum obtainable density used for relative compaction calculation.
- h) Nuclear gauge in-place density and relative compaction. Perform compaction testing within each Lot at 10 random locations. Relative compaction of the Lot shall be the average of the 10 locations divided by maximum obtainable density obtained in the test strip (as percent). Relative compaction of each of the 10 individual locations must be greater than or equal to 95 percent and less than or equal to 105 percent of the maximum obtainable density obtained in the test strip. Relative compaction of the Lot must be greater than or equal to 97 percent and less than or equal to 103 percent of the maximum obtainable density obtained in the test strip. Re-work or re-process any Lot not in conformance.
- i) Ambient and compacted recycled pavement surface temperatures.

- j) Maximum theoretical density under California Test 309 and void ratio (Report Only). On a daily basis during CIRACP operations, the Contractor shall take and split a sample of the CIRACP from a location approved by the Engineer. The samples shall be split into 2 parts and the containers labeled with the location and station. The Contractor shall submit 1 container to the Engineer and use the other for testing. The maximum theoretical density shall be determined in accordance with California Test 309. The maximum theoretical density shall be used to calculate the void ratio for each nuclear gauge site and Lot. The Contractor shall report daily, quality control inspection records and sampling and test results.
- k) 12-foot straightedge measurements, both initial and after corrections
- I) Rate of fog seal coat application.
- m) Rate of sand cover application.

Some sections of the pavement being recycled may require field adjustment for optimum results. The Contractor shall adjust the rate of emulsified recycling agent, additives and water as necessary based on the coating, compaction and breaking properties of the emulsified recycling agent. For any changes made by the Contractor from one Lot to the next, the Contractor shall document the reason for the change and identify each Lot where such changes were made.

A new rolling pattern and a new maximum obtainable density shall be established if any of the following occurs:

- Relative compaction of any of the 10 individual locations is less than 95 percent or greater than 105 percent of the maximum obtainable density obtained in the test strip.
- o) Relative compaction of the Lot is less than 97 percent or greater than 103 percent of the maximum obtainable density obtained in the test strip.
- p) There are changes in RAP, or the CIRACP mixture or proportions.
- q) There are changes in placement equipment or procedures.
- r) There is a significant change in temperature or weather conditions or other environmental controlling factor.
- s) There is major displacement and/or cracking of the CIRACP mixture.

Should a change in the rolling pattern or additional rolling produce results that do not meet relative compaction requirements, additional test strips shall be constructed to determine the maximum obtainable density for the CIRACP mixture being produced, and the rates of emulsified recycling agents, additives, and water for the existing site conditions.

The Contractor shall perform inspection, sampling, and testing at a rate sufficient to ensure that the CIRACP mixture, placement, compaction and finish surface conform to the Specifications.

The Contractor shall maintain accurate records of all tests it performs as part of its Quality Control Program and shall make these records available to the Engineer upon request. The Contractor shall satisfy itself that its materials and workmanship, including those of its subcontractors and suppliers, are in conformance with the Contract Documents. The Contractor shall submit copies of all Quality Control tests it has performed to the Engineer for review prior to requesting the Agency to perform Quality Assurance testing.

903-1.7 Just-In-Time Training (JITT).

903-1.7.1 General. JITT is a formal joint training class on CIRACP materials, equipment, placement, compaction methods and quality control. JITT may be conducted as an extension of the Pre-Paving Conference at the Contractor's option. Construction operations for CIRACP shall not begin until the Contractor's personnel have completed the mandatory training.

903-1.7.2 Class Requirements. The JITT class must be:

- a) At least 2 hours long.
- b) Completed within 7 Days before beginning CIRACP work.
- c) Conducted during normal working hours.

The following Contractor personnel shall complete JITT:

- d) The Contractor's project manager.
- e) The Contractor's Representative.
- f) The Contractor's paving foreman.
- g) The Contractor's paving equipment operators.
- h) Quality control staff.
- i) Testing technicians.

The following personnel will also be in attendance:

j) The Engineer and other Agency staff.

The training class shall be conducted at a location convenient for both the Contractor and the Engineer. Personnel having attended CIR JITT in the last 12 months must submit certificates of completion when requesting exemption from attendance.

The JITT instructor shall be provided by the Contractor, and shall be experienced in the construction methods, materials, and test methods associated with construction of CIR projects. The JITT instructor shall not be an employee of the Contractor, any Subcontractor, or of the Agency. Upon completion of JITT, the instructor shall issue a certificate of completion to the participants.

The Contractor and the Engineer will mutually agree to the course instructor, course content, and training site. Just-In-Time Training shall not relieve the Contractor of responsibility under the Contract for the successful completion of the Work in conformance with the requirements of the Plans and Specifications.

Submittals. The Contractor shall submit the following to the Engineer a minimum of 21 Days prior to the scheduled date of the JITT:

- a) Name(s) of instructor(s) and their qualifications and work experience.
- b) Copy of course syllabus, handouts, and presentation materials.
- c) JITT facility location.
- d) Staff name, title, duties/assignment attending the JITT.

903-1.8 Production and Placement.

903-1.8.1 General. CIRACP operations shall neither start nor be performed during wet conditions, or if rain or cold conditions (less than 50°F) are forecast within a 48 hour period by the National Weather Service for the most representative and nearest location listed where the CIR is to begin and end. The forecast ambient temperature shall be a minimum of 60°F and rising throughout the recycling operation until initial compaction and protection operations have been completed for that Day's run. CIRACP operations shall cease if the actual ambient temperature drops below 60°F anytime after an initial 3 hour window following start-up. CIRACP operations shall be completed at least 2 hours before sunset.

CIRACP damaged by inclement weather shall be replaced by the Contractor at the Contractor's expense as directed by the Engineer. The Contractor shall ensure that cold milling does not result in gaps of pavement which has not been recycled result along longitudinal edges nor in wedges created by the entry of the cold milling drum into the existing pavement. Longitudinal joints between successive cuts shall overlap a minimum of 4 inches.

903-1.8.2 Sequence of Work. The general sequence of work for production of CIRACP shall be as follows:

- a) Surface Preparation.
- b) Milling, crushing, and sizing.
- c) Mixing and proportioning.
- d) Spreading and initial compaction.
- e) Test Strip.
- f) Fog seal coat and sand cover.
- g) Curing and protection.
- h) Supplemental compaction.

- **903-1.8.3 Pre-Paving Conference.** A minimum of 5 Working Days prior to the scheduled start of CIRACP placement and production, the Engineer will arrange a meeting with the Contractor's Representative, the Contractor's paving foreman, the CIRACP subcontractor, materials suppliers, and representatives of the Agency. The following will be discussed:
 - a) CIRACP placement plan.
 - b) Equipment.
 - c) Rate of delivery/placement.
 - d) Agency inspection.
 - e) Traffic control.
 - f) Other topics as may be proposed.
- **903-1.8.4 Roadway Surface Preparation**. Prior to the start of CIRACP operations, the Contractor shall prepare the roadway surface by:
 - a) Removing any dirt, vegetation, standing water, combustible materials, oils, raised pavement markers, and objectionable materials.
 - b) Referencing the existing pavement profile and cross slope as shown on the Plans.
 - c) Marking the proposed longitudinal cut lines on the existing roadway surface.
- **903-1.8.5 Cold Milling, Crushing, and Screening.** Cold milling, crushing, and screening shall The RAP shall be processed to 1 inch maximum size and be free of dirt, base, concrete or other deleterious materials.

Residual materials that cannot be completely removed from the processed RAP may be incorporated into the recycled mix upon approval of the Engineer after demonstration by the Contractor that such materials will not adversely affect the performance, appearance, or strength of the CIRACP. The existing pavement shall be cold milled to the depth shown on the Plans.

903-1.8.6 Mixing and Proportioning. Using a mass flow centrifugal type meter, the Contractor shall measure and weigh the emulsified recycling agent, and the cement or lime to be added into the RAP. The Contractor shall compare the amount of each additive against the amount reported in the approved CIRACP mix design or the adjusted amount approved by the Engineer. Each mixing and proportioning unit shall be properly calibrated in accordance with California Test 109. Water may be added by the milling machine to facilitate uniform mixing of the emulsified recycling agent and the RAP. Water added shall be measured and the rate of added water shall be between 0.5 and 5.0 percent of water added by weight of the recycled pavement mixture in accordance with the approved CIRACP mix design. The quantity of residual asphalt in the recycling agent incorporated into the final recycled pavement mixture shall not vary due to the addition of water.

903-1.8.7 Mixing and Spreading Cement and Lime.

903-1.8.7.1 General. Proportioning of cement or lime slurry may be accomplished by either continuous mixing or batch mixing. Cement or lime slurry may be added directly to the pugmill or may be sprayed over the cutting teeth of the milling machine at a rate specified in the approved CIRACP mix design. The Contractor shall provide the Engineer with daily batch logs.

Dry cement may be spread upon the existing asphalt concrete surface ahead of the recycling train at the rate specified in the CIRACP mix design. If cement is spread ahead of the milling operation, the distance between the spreader and the recycling equipment shall be reduced as necessary to prevent being blown off the surface during windy days. In no case shall additives be allowed to remain exposed at the end of the Day. No traffic other than the recycling equipment shall be allowed to pass over the spread additive until the recycling operation is complete.

903-1.8.7.2 Proportioning Cement Or Lime Slurry.

- **a) Continuous Mixing Proportioning.** The proportioning device must determine the exact ratio of water to dry lime or cement at each production rate. Rate-of-flow indicators and totalizers for like materials must be accurate within 0.5 percent of each other. The following method shall be used:
 - i) A belt scale shall be used to weigh cement or dry lime. When the belt scale operates between 30 percent and 100 percent of production capacity, the average difference between the indicated material weight and the actual material weight shall not exceed 0.5 percent of the actual material weight for 3 individual runs. For any of the 3 individual runs, the indicated material weight shall not vary from the actual material weight by more than one percent of the actual material weight. Tests for belt scale accuracy must be for at least 0.5 tons of cement or lime. Actual material mass shall be weighed on a certified scale.
 - ii) A meter shall be used to measure water in the slurry. When the meter operates between 50 percent and 100 percent of production capacity, the average difference between the indicated water weight and the actual water weight shall not exceed one percent of the actual weight for 3 individual runs. Tests for water meter accuracy must be for at least 300 gallons of water. Actual mass shall be weighed on a certified scale.
 - iii) Meters and scales used shall be equipped with rate-of-flow indicators that show the delivery rates of cement or lime and water and resettable totalizers that indicate the total amounts of cement or lime and water introduced into the slurry storage tank. Individual feeds for water and cement or lime shall be equipped with no-flow devices that stop slurry production when either of the individual ingredients is not being delivered to the slurry storage tank.

- **b) Batch Mixing Proportioning.** For batch-type proportioning for slurry production, the following method shall be used:
 - iv) Cement or dry lime shall be weighed with a certified scale.
 - v) Water meter shall be equipped with a resettable totalizer. If an automatic controller is used to batch the cement or lime it shall also control the water proportioning. If an automatic controller is used to proportion the water the indicated draft of the water must be within one percent of its total draft weight. The water meter shall be tested for accuracy at least as often as 300 gallons of water used.
 - vi) When the meter operates between 50 percent and 100 percent of production capacity, the average difference between the indicated water weight and the actual water weight shall not exceed one percent of the actual water weight for 3 individual runs.
- **903-1.8.8 Spreading.** The CIRACP mixture may be placed in a windrow or deposited directly into the hopper of the track paver.

Immediately upon completion of the mixing and proportioning of the CIRACP mixture, the mixture shall be spread in one continuous pass without segregation to the lines and grades shown on the Plans. The wings of the track paver shall be emptied regularly to minimize segregation as well as to prevent buildup. Handwork of CIRACP shall be minimized while spreading.

Based on the ambient temperatures, weather conditions, and type of emulsified recycling agent used, the Contractor shall determine and record the time intervals between spreading and compacting of the CIRACP. The final time interval shall be recorded in the daily quality control documents.

903-1.9 Compaction.

- **903-1.9.1 General.** Upon completion of the spreading operations, the CIRACP shall be. Areas inaccessible to rollers shall be compacted to the required density by other equipment approved by the Engineer.
- **903-1.9.2 Initial Compaction and Initial In-Place Density**. Initial compaction operations shall start no more than 15 minutes behind the track paver unless otherwise approved or directed by the Engineer. Compacting of the CIRACP shall follow the rolling pattern established on the test strip and verified by the Engineer.

Rolling shall be performed in a manner that results in starting and stopping taking place on previously compacted material.

The CIRACP mat shall be continuously observed during compaction. If moisture cracking occurs under the vibratory compaction mode, the vibrators shall be turned off and static rolling only performed. If moisture cracking continues under static steel drum rolling, compaction shall cease, the mat allowed to further cure in order for additional moisture to escape, and pneumatic-tired rolling commenced, followed by steel drum rolling to iron out irregularities. This procedure shall be followed until there is no longer any displacement of the mat produced by rolling.

The selected rolling pattern shall be followed unless changes in the CIRACP mixture or placement conditions occur and a new rolling pattern is established. Rolling that causes cracking, major displacement and/or any other type of pavement distress shall be discontinued until such time as the problem can be resolved. Discontinuation and commencement of rolling operations shall be at the discretion of the Engineer.

The Contractor shall ensure that aggregate from the CIRACP mixture does not stick to the drums or wheels of the rollers. Water shall be uniformly applied to the wheels and drums, along with mechanical means to keep aggregate from sticking. Sufficient water shall be applied to keep rollers and tires clean, but not so much that water pools or ponds on the recycled surface.

The final compacted surface of the CIRACP mixture shall be free of ruts, bumps, indentations, raveling, irregularities, or segregation. The smoothness of the finished surface shall be checked regularly during placement using a 12-foot long straightedge. The smoothness shall not vary more than 3/8 inch from a 12-foot straightedge placed on the surface. Areas that vary from the lower edge by more than 0.01 foot when the straight edge is laid parallel with the centerline, or more than 0.02 foot when the straightedge is laid perpendicular to the centerline and extended from edge to edge of a traffic lane, shall be corrected by reworking, re-compaction, or removal and replacement. The correction method chosen by the Contractor must be approved by the Engineer before starting any corrective work.

Corrected areas must be uniform rectangles with edges that are parallel to the nearest HMA pavement edge or lane line; or perpendicular to the pavement centerline.

903-1.10 Test Strip.

903-1.10.1 General. A test strip of a single lane width and a minimum of 1,500 feet in length located within the limits of the CIRACP work shall be constructed on the first Working Day of CIRACP operations. The test strip section shall:

- a) Demonstrate that the equipment, materials, processes, and proposed job mix formula (mix design) is capable of producing and constructing a CIRACP that conforms to the requirements of these Specifications;
- b) Establish the optimal rates for emulsified recycling agents, additives, and water recommended for the reclaimed asphalt pavement;

- c) Determine the effect on the CIRACP mixture at various forward speed rates, drum rotation rates of the cold milling or mixing equipment; and
- d) Establish the sequence and manner of rolling necessary to achieve the maximum obtainable density using a compaction rolling pattern developed in the field by the Contractor and reviewed by the Engineer. A rolling pattern for compaction shall be defined as that which produces no increase in density on successive nuclear density tests for any additional passes of the compaction equipment once the maximum density pattern has been identified ("breakover point"). The Contractor shall prepare a rolling vs. density chart that shows the progress of densification from initial lay down through maximum obtainable density at the "break over point."
- e) The Contractor shall determine relative compaction on the quantity within the test strip by nuclear gauge density (ASTM D2950). If the relative compaction within the test strip does not meet the density requirements, the Contractor shall construct additional test strips as necessary to determine the maximum density obtainable.

Upon completion of the test strip, the Contractor shall provide a report to the Engineer with the following information:

- a) Length, width, and depth of milling and calculated weight in tons of material processed.
- b) Weight of emulsified recycling agent added in tons.
- c) Percentage of added emulsified recycling agent in the CIRACP mixture by weight.
- d) Percentage of recycling additive in the CIRACP mixture by weight.
- e) Maximum particle size of the RAP before the addition of the emulsified recycling agent.
- f) Maximum obtainable density used for relative compaction calculation.
- g) Nuclear gauge in-place density and relative compaction at 10 random locations.
- h) A rolling vs. density chart that shows the progress of compaction from initial laydown through maximum obtainable density at the "break over point".
- i) Ambient and compacted recycled pavement surface temperatures.
- j) Maximum theoretical density determined in accordance with California Test 309 and void ratio (Report Only).

903-10.2 Approval. CIRACP work shall proceed upon the approval of the test strip by the Engineer. Test strips that fail, or do not demonstrate or fulfill the requirements shall be re-worked, re-compacted, or removed and replaced. The Contractor shall determine the corrective actions to be taken, discuss the adjustments or changes with the Engineer, and obtain approval from the Engineer before proceeding. If adjustments are made, the Contractor shall construct a new test strip to define the maximum density.

The Contractor shall use the same equipment, materials, and construction methods for the remainder of CIR operations, unless adjustments are made by the Contractor and approved by the Engineer.

903-1.11 Fog Seal Coat and Sand Cover. After initial compaction has been achieved, and prior to opening the CIRACP to traffic, the Contractor shall apply a fog seal coat to the CIRACP surface which shall be composed of emulsified asphalt diluted with water at a ratio not to exceed 1:1 unless otherwise approved by the Engineer. The application rate of the fog seal coat shall be between 0.08 and 0.12 gallon per square yard. Immediately following application of the fog seal, the CIRACP surface shall be covered with sand at a rate of 1.0 to 2.0 pounds per square yard. The exact rate will be determined by the Contractor. Excess sand shall be removed from the CIRACP surface by sweeping.

903-1.12 Curing, Maintenance, and Protection. CIRACP shall cure in-place either for a minimum of 3 Days and until the percent moisture at the mid-depth of the CIRARP is less than 1.5 percent, or for a minimum of 10 Days without rainfall.

The Contractor shall be responsible for protecting and maintaining the CIRACP free from nuisance water, other deleterious substances, and/or any other damage. Any damage to the completed recycled material shall be repaired by the Contractor prior to the placement of new asphalt concrete or final surface sealing. Areas damaged shall be excavated to the depth directed by the Engineer and/or filled and compacted with new asphalt concrete. All loose particles that may develop on the pavement surface shall be removed prior to the final surface course.

903-1.13 Supplemental Compaction. Supplemental compaction shall be conducted after the CIRACP has cured and prior to any smoothness testing or placement of a new asphalt concrete surface course.

The Contractor shall construct a test strip on the first Day of supplemental compaction operations. The test strip shall be a single lane in width and at least 1,500 feet in length. The test strip must demonstrate the sequence and methods of rolling necessary to determine the maximum obtainable density. A rolling pattern for compaction shall be defined as that which produces no increase in density on successive nuclear density tests for any additional passes of the compaction equipment once the maximum density pattern has been identified ("break over point").

For each Lot, compaction testing at 10 random locations shall be conducted and the in-place density and relative compaction obtained. The relative compaction of the Lot using the average of the in-place density of the 10 locations and the maximum obtainable density from the supplemental compaction test strip shall be determined and recorded.

Relative compaction of each of the 10 individual locations shall be greater than or equal to 95 percent and less than or equal to 105 percent of the maximum obtainable density obtained in the test strip. Relative compaction of the Lot must be greater than or equal to 97 percent and less than or equal to 103 percent of the maximum obtainable density obtained in the test strip. Nuclear density testing shall be repeated throughout the time final compaction is being completed to verify that the final compaction is being achieved. Care shall be taken not to over compact the CIRACP. The Contractor's qualified technician shall be on site and observing all final compaction efforts, monitoring density gauge readings, and approving areas as they reach maximum density.

For each Lot, the Contractor shall measure or calculate and record the following information:

- a) Length and width.
- b) Maximum theoretical density used for compaction calculation.
- c) Nuclear gauge in-place density and relative compaction at 10 random locations.
- d) Relative compaction for the Lot.
- e) Ambient temperature and surface temperature of compacted CIRACP.
- f) Average in-place density and relative compaction.

If the relative compaction does not meet requirements, the Contractor shall construct additional test strips as necessary to determine the maximum obtainable density for the in-place CIRACP.

The Contractor shall measure or calculate and record the following information:

- a) Length and width of CIR surface processed.
- b) Maximum obtainable density.
- c) Nuclear gauge in-place density and relative compaction at 10 random locations.
- d) A rolling vs. density chart that shows the progress of densification from initial laydown through maximum obtainable density at the "break over point".
- e) Ambient and compacted recycled pavement surface temperatures.

Upon approval of the test strip by the Engineer, the supplemental compaction may begin. Compaction shall cease if the equipment and process fail to meet the requirements for a test strip. If the test strip fails, the Contractor shall re-work, recompact, or remove and replace the test strip and discuss and document corrective actions to be taken with the Engineer before proceeding.

903-1.14 Measurement. CIRACP will be measured by the square yard of finished surface for each thickness shown on the Plans. CIRACP outside the limits shown on the Plans will not be measured for payment. Test strips conforming to the requirements of these Specifications will be included in the quantity measured for payment.

Emulsified recycling agent will be measured by the ton. *The quantity in the Bid is based on a content of ____ percent.* The basis of payment shall be the net weight of emulsified recycling agent used to produce CIRACP complete in-place. The Contractor shall furnish the Engineer with certified weighmaster certificates showing the weight of each load delivered to the Work site and the weight remaining on the Work site after completion. Payment will be made for the difference between the weight delivered to the Work site and the weight of emulsified recycling agent remaining on the Work site after completion of CIRACP. The provisions of 3-2.2.2 and 3-2.2.3 of the SSPWC shall not apply to this Bid Item.

903-1.15 Payment.

[Include the following if the Contractor is required to prepare the mix design:]

The lump sum price in the Bid for "CIRACP MIX DESIGN, SAMPLING, AND TESTING" shall be considered full compensation for all work necessary to develop the CIRACP mix design(s), and to perform all sampling and testing, determine gradations, obtain measurements, record test results, and prepare and submit mix designs.

[End Contractor-prepared mix design payment inclusion.]

Payment for CIRACP will be made at the Contract Unit Price for "CIR AC PAVEMENT, _" THICK."

The Contract Unit Price shall include preparing and implementing a quality control program, JITT including payment for the instructor and training materials, producing and placing CIRACP, constructing and reconstructing test strips, re-working material in overlapping adjacent milled widths, fog seal coat, protection and maintenance of the CIRACP, and other incidental and appurtenant work for which no separate Bid item is listed in the Bid.

No payment will be made for test strips which have been rejected or for removal of rejected test strips.

Payment for emulsified recycling agent will be made at the Contract Unit Price per ton for "EMULSIFIED RECYCLING AGENT." The Contract Unit Price shall include furnishing and incorporating the emulsified recycling agent into the CIRACP.

No separate payment will be made for any corrective actions to repair the roadway using hot mix asphalt concrete payement in the event of equipment breakdown.

903-2 COLD CENTRAL-PLANT RECYCLED ASPHALT CONCRETE PAVEMENT (CCPRACP).

- **903-2.1 General.** CCPRACP shall consist of 100 percent reclaimed asphalt pavement (RAP), stockpiled, processed, and mixed with emulsified recycling agent and other additives in a mobile cold recycling mixing plant erected and operated in a temporary, stationary location. CCPRACP shall be uniformly mixed, spread, compacted, finished, and cured in such a manner that the in-place mixture forms a dense, uniform mass conforming to the lines, grades, and cross sections shown on the Plans.
- **903-2.2 Submittals.** The Contractor shall submit the following in accordance with 2-5.3:
 - a) CCPRACP mix design (job mix formula). [Include only if the Contractor prepares the mix design.]
 - b) Two, 2-quart samples of emulsified recycling agent with the mix design submittal. [Include only if the Contractor prepares the mix design.]
 - c) Quality Control Plan per 903-1.6.2.

The Contractor shall submit the following to the Engineer during production and placement:

- d) Test results and Certificates of Compliance conforming to 4-1.5 of the SSPWC for the emulsified recycling agent and each additive with each delivery to the Work site. Test results may represent a batch or a Day of production. An AASHTOaccredited laboratory shall perform the testing.
- e) Certified weighmaster certificates showing the net weight of each load of emulsified recycling agent, additives, emulsified asphalt (fog seal coat), and sand (fog seal coat) delivered to the Work site.
- f) On a daily basis during cold-central-plant operations, the Contractor shall submit:
 - i) Quality control inspection records, and sampling and test results.
 - ii) One, 2-quart sample of emulsified recycling agent from each load delivered to the Work site no later than 1 hour after samples are taken.
 - iii) Batch logs for cement or lime slurry production.
 - iv) Dilution data for emulsified asphalt.
- g) During supplemental compaction of the CCPRACP surface, quality control inspection records, and sampling and test results.

903-2.3 Materials.

903-2.3.1 General. Materials include RAP generated from cold milling existing asphalt concrete within the limits of the Work, emulsified recycling agent, additive, and water.

903-2.3.2 Reclaimed Asphalt Pavement (RAP). RAP shall be produced by cold milling the existing asphalt concrete pavement on roadways within the limits of the Work. RAP shall be crushed and screened in accordance with 903-2.8.4.

[Include the following if RAP from outside the limits of the Work is needed:]

If the quantity of RAP generated within the limits of the Work is less than that required to produce the quantity of CCPRACP shown in the Bid, RAP may be imported from outside the of the Work. Imported RAP shall be subject to testing by the Agency for comparison to the CCPRACP mix design. The Contractor shall allow 25 Working Days for Agency testing.

[End inclusion.]

903-2.3.3 Emulsified Recycling Agent. Emulsified recycling agent shall conform to the requirements shown in Table 903-2.3.3 (A).

Table 903-2.3.3 (A): Emulsified Recycling Agent

		Requirement		
	Test Method	Minimum	Maximum	
Tests on Emulsion:				
Sieve test, % of weight sample	AASHTO T59 1		0.1	
Residue by distillation, %	AASHTO T59 1	60		
Rap Coating Test (min.)	AASHTO T59 ²	Good		
Tests on Residue by Distillation:				
Penetration at 25°C, 100g / 5 sec (TV) (min.)	AASHTO T49 ^{2,4}	TV +/- 25 percent ³		
Absolute Viscosity at 60°C, pascal second (x10 ⁻¹) (TV) ⁴	AASHTO T2171	Repo	ort Only	

Notes:

- 1. Modify AASHTO T 59 distillation temperature of 350°F with a 20-minute hold.
- 2. CIR mixture emulsified recycling agent and water application rates to be determined using Work site RAP in CIR mix design and submitted in job mix formula.
- 3. Target value (TV) is determined for emulsified recycling agent chosen for use and submitted in job mix formula.
- 4. Sieve residue from distillation on No. 20 sieve before determining viscosity.

Paving asphalt used to make the emulsified recycling agent shall be PG 64-10 conforming to 203-3.1 of the SSPWC.

At the Contractor's option, the emulsified recycling agent may contain a latex polymer and/or a rejuvenating agent. The latex polymer shall conform to the requirements shown in Table 903-2.3.3 (B). The rejuvenating agent shall conform to the requirements shown in Table 903-2.3.3 (C).

Table 903-2.3.3 (B): Latex Polymer

Test on Latex Polymer	Test Method	Requirement
Specific Gravity, min.	ASTM 1475	1.08
Tensile strength, die C dumbbell, psi, min.	ASTM D412 ⁵	500
Swelling in rejuvenating agent, % max. 48 hours exposure	ASTM D471 ⁶	40%
@ 104°F	Modified	intact film

Votes:

- 5. Tensile Strength Determination: Samples for testing for tensile strength in accordance with ASTM D412 shall be cut using a die dumbbell at a crosshead speed of 20 inches/min.
- 6. Latex Testing: Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section. Polymer film shall be prepared from latex as follows:

Resistance to Swelling: Polymer films shall be formed by using a 50 mil drawdown bar and drawing down 50 mils of the latex on polyethylene boards. Films shall be cured for 14 days at 75°F and 50% humidity. Samples for resistance to swelling in rejuvenating agent shall be 1" by 2" rectangles cut from the cured film. Cut at least 3 specimens for each sample to be tested for swelling. Fill 3-8 oz ointment tins with at least a $\frac{1}{2}$ " deep of rejuvenating agent. Swelling samples shall be weighed and then placed in the ointment tins on top of the rejuvenating agent. Then, add at least another $\frac{1}{2}$ " deep of rejuvenating agent over each of the latex samples. The ointment tins shall be covered and placed in an oven at 104°F for the specified 48 hours +/- 15 minutes. The ointment tins are allowed to cool to 75°F and then the latex films are removed from the tins. Unabsorbed rejuvenating agent is removed from the tins or while removing the unabsorbed rejuvenating agent the sample shall be rejected. After the rejuvenating agent is removed from the samples they are then weighed. Percent swelling is reported as weight increase of the polymer film; report mass increase as a percent by weight of the original latex film mass upon exposure of films to the recycling agent.

Table 903-2.3.3 (C): Rejuvenating Agent

Table 300 2:0:0 (0): Nejavenating Agent				
Test on Rejuvenating Agent	Test Method	Requirement		
Viscosity, 140 °F, CST	ASTM D2170	50-175		
Flash Point, °F, COC	ASTM D92	380 Min.		
Saturate, % by weight	ASTM D2006-70	30 Max.		
Asphaltenes	ASTM D2872	1.0 Max.		
Test on Residue				
Weight Change, %	ASTM D2872	6.5 Max.		
Viscosity Ratio	ASTM D2170	3 Max.		

903-2.3.4 Water. Water added shall be potable, clean, and free of deleterious concentrations of acids, alkalis, salts, sugar and other organic or chemical substances.

903-2.3.5 Additive. The additive, if so specified in the approved mix design, shall be Type II Portland cement or lime. Portland cement shall conform to 201-1.2.1. Portland cement shall be limited to no more than 1.0 percent by dry weight of RAP.

Lime shall conform to the chemical requirements in ASTM C977 except it shall have a minimum of 90 percent available calcium oxide. Air slaked, by-product or waste lime is not permitted and will be rejected. Quicklime shall be supplied from a single source, protected from moisture until application, and sufficiently dry to flow freely when handled. Dry lime shall be high-calcium quicklime. Lime slurry shall be produced at the Work site.

Additives shall be incorporated into the CCPRACP mix as determined by the CCPRACP mix design.

903-2.3.6 Emulsified Asphalt. Emulsified asphalt for fog seal coat shall be CQS-1h conforming to 203-3.4.3 of the SSPWC unless otherwise approved by the Engineer.

903-2.3.7 Rock Dust Blotter. Rock dust blotter shall conform to 200-1.2 of the SSPWC.

903-2.4 Mix Design.

[Include the following if the Agency has prepared the mix design:]

The Agency has prepared the mix design for this Contract. The mix design will be furnished to the Contractor. *The emulsified recycling agent percentage, by dry weight of RAP, shall be _ percent.*

[End inclusion.]

[Include 903-2.4.1, 903-2.4.2, and 909-2.4.3 if the Contractor is required to prepare the mix design:]

903-2.4.1 General. The Contractor shall submit a mix design(s) in accordance with 2-5.3 and 903-2.2. The mix design(s) shall be prepared by a Caltrans certified testing laboratory, and shall be signed and stamped by a State of California Registered Civil Engineer. The component materials used in the mix design must be the same materials that will be used during CCPRACP production and placement.

Based on the characteristics of the RAP taken from the Work site, more than one mix design may be required.

The CCPRACP mixture shall conform to the requirements shown in Table 903-2.4.1.

Table 903-2.4.1 CCPRACP Mixture Design Requirements

Table 500 Elitt Got 17701 Milktare Beelgii Requ	• •
Quality Characteristic/Test Method	Requirement
Gradation of Reclaimed Asphalt Pavement (RAP): CT 202	1-inch maximum
Asphalt Content of RAP: CT 362 or CT 379 or ASTM D2172 Method B	Report
Bulk Specific Gravity of Compacted Samples ^{1, 2} : CT 308, Method C	Report
Maximum Theoretical Specific Gravity ² : CT 309, including provisions of Section J	Report
Air Voids of Compacted and Cured Specimens ² : CT 367, Part B	Report
Marshall Stability, Cured Specimen ² : AASHTO T 245, 104 °F (min.)	1250 lbs
Marshall Retained Stability, AASHTO T 245, 104 °F based on Moisture Conditioning on Cured Specimen (min.) ^{2, 3}	70% 4
Ratio of Emulsion Residue to Cement (min.)	3.1
Raveling Test of Cold Mixed Bituminous Emulsion, ASTM D7196, 50 °F (max)	7.0
RAP Coating Test, ASSHTO T59 ⁵ , (min.)	Good

Notes:

- 1. 4-inch diameter mold compaction based on either 75 blow Marshall on each side or gyratory compactor at 30 gyrations.
- 2. Test specimens after 140°F curing to constant weight between 16 hours and 48 hours.
- 3. Vacuum saturation from 55 percent to 75 percent. Water bath at 77 °F for 23 hours, with the last 30 minutes to 40 minutes in 104 °F water bath.
- 4. The Marshal Retained Stability ratio may be reduced to 60%, providing the saturated Marshall Stability is at least 1500 lbs.
- 5. Modify ASSHTO T59 using jobsite RAP, emulsified recycling agent and water application rates that have been determined in the CCPR mix design and submitted in job mix formula.

During preparation of the mix design, the Contractor shall determine the target values for penetration at 77°F (25°C) and viscosity at 140°F (60°F) of the emulsified recycling agent to be used in the production of the CCPRACP mixture. The Contractor shall provide current test results for the emulsified recycling agent and additives at the time of the mix design.

903-2.4.2 Emulsified Recycling Agent Percentage.

- **903-2.4.2.1 General.** This procedure is used to determine the percent and grade of the emulsified recycling agent to be used when producing CIRACP.
- **903-2.4.2.2 Core Samples.** A representative baseline of core samples for use in the mix design(s) shall be taken from the existing pavement at the Work site. A minimum of one core shall be obtained for each 1/2 lane-mile, and where visual differences in the pavement type or structural section occur. Cores shall be cut to the thickness shown on the Plans for CIRACP.

When core samples indicate significant variation in the type or thickness of existing pavement courses, separate mix designs shall be developed for each common pavement type segment.

A minimum of 350 pounds of RAP shall be obtained from the Work site for use in determining the mix design(s). A representative sample of each common pavement type shall be tested in accordance with California Test 362, California Test 379, or California Test 382 to determine the asphalt content of the RAP.

Two mix designs shall be developed for each gradation shown in Table 903-2.4.2.2 by recombining the RAP material.

TABLE 903-2.4.2.2

Sieve Size	Target Value (Percent Passing)		
	Medium Gradation	Coarse gradation	
1"	100	100	
3/4"	95 ± 2	85 ± 2	
No. 4	50 ± 2	40 ± 2	
No. 30	10 ± 2	5 ± 2	
No. 200	0.8 ± 0.3	0.3 ± 0.3	

Gradation of the RAP after milling or crushing shall be determined in accordance with California Test 202 with the exception that drying of the RAP samples to constant mass shall be performed at 104 ± 4 °F.

903-2.4.2.3 Mixing Specimen Size. The Contractor shall determine the amount of RAP necessary to produce a 2.5 ± 0.1 inch tall specimen when compacted in accordance with 903-2.4.2.5.

903-2.4.2.4 Number of Specimens. The Contractor shall select 3 emulsified recycling agent values bracketing the estimated recommended emulsified recycling agent content for the stability tests. The 3 values, in either 0.5 percent or 1.0 percent increments, shall cover a range between 0.5 percent and 4.0 percent by dry weight of RAP.

For stability testing 6 samples shall be compacted at each emulsified recycling agent value, 3 for Marshall stability on cured samples, and 3 for Marshall stability on cured samples for moisture conditioning.

Two specimens shall be used to determine the theoretical maximum specific gravity in accordance with California Test 309, Section J, with the exception that the loose RAP mixture shall by cured in an oven at $140 \pm 2^{\circ}F$ to constant weight (0.05 percent change in weight in 2 hours) for not less than 16 hours and not more than 48 hours. Any agglomerates which will not easily reduce with a flexible spatula shall be left unbroken. Both specimens shall be tested at the highest emulsified recycling agent content in the design, and the lower emulsified recycling agent values shall be back calculated.

Moisture shall be added at a rate expected to match that at the milling head, typically between 1.5 to 2.5 percent.

Additives, if used, shall be incorporated in a manner to emulate field production.

Mixing of test specimens shall be performed manually, with a mechanical bucket mixer, or by a combination of the two. RAP shall first be thoroughly mixed with water then with emulsified recycling agent, one specimen at a time, at an ambient temperature of 77 ± 4 °F. The mixing time with emulsified recycling agent shall not exceed 60 seconds.

903-2.4.2.5 Compaction of Specimens. Specimens shall be compacted after mixing at an ambient temperature of 77 ± 4 °F.

For stability testing purposes specimens shall be compacted in 4-inch molds with a Marshall compactor by applying 75 blows per side or with a gyratory compactor at 30 gyrations.

Molds and test equipment shall remain unheated.

Paper disks, when used, shall be placed on the top and bottom of the specimen before compaction, and removed immediately after compaction.

Specimens shall be removed from molds after compaction without damage to the samples.

903-2.4.2.6 Curing Specimens after Compaction. Specimens shall be placed in a $140 \pm 7^{\circ}$ F forced draft oven with ventilation on the top and sides. Each specimen shall be placed in a small container to account for material loss.

Compacted specimens shall be cured at $140 \pm 2^{\circ}F$ to constant weight (< 0.05 percent change in weight in 2 hours), but for no more than 48 hours and no less than 16 hours. After curing, specimens shall be cooled at ambient temperature for a minimum of 12 hours and a maximum of 24 hours.

The same oven conditioning and volumetric measurements on moisture-conditioned specimens shall be used as on other specimens.

Moisture conditioning shall be performed on 3 compacted samples at each emulsified recycling agent content value by applying a vacuum of 10 to 26 inches of mercury (Hg) partial pressure for a sufficient duration to vacuum saturate samples to 55 to 75 percent. Saturation shall be calculated by comparing saturated surface mass with dry mass in air. Moisture conditioned samples shall be soaked in a 77 \pm 2°F water bath for a minimum of 22 hours and a maximum of 24 hours, followed by a 30 to 40 minute soak at 140 \pm 2°F.

903-2.4.2.7 Measurements. Asphalt content of the RAP shall be determined in accordance with California Test 362, California Test 379, or California Test 382.

Bulk specific gravity shall be determined on each compacted, cured, and cooled specimen in accordance with California Test 308, Method C.

Specimen heights shall be determined in accordance with California Test 308 Section D2e. Alternatively, the height can be obtained from the SGC readout if the gyratory compactor is used.

Maximum theoretical specific gravity shall be determined in accordance with California Test 309, Section J, with the exception specified in 903-2.4.2.4.

Air voids of the compacted and oven-cured samples of each emulsified recycling agent content value shall be determined in accordance with California Test 367, Part B.

Corrected Marshall stability shall be determined by AASHTO T245 at 140 \pm 2°F after 2 hour temperature conditioning in a forced draft oven or immersion in a water bath for 30 to 40 minutes. This test shall be performed at the same time as testing of the moisture-conditioned specimens.

- 903-2.4.2.8 Marshall Retained Stability. The average moisture conditioned specimen strength divided by the average dry specimen strength is defined as retained stability.
- **903-2.4.2.9 Raveling Test on Recycled Asphalt Specimens.** Raveling percentage shall be determined in accordance with ASTM D7196.
- **903-2.4.3 Mix Design Submittal.** The CCPRACP mix design shall include the following:
 - Results for all tests conducted to verify compliance with the CCPRACP mixture design requirements.
 - b) Gradations of RAP used in lab procedure.
 - Recommended quantity of emulsified recycling agent as a percentage by weight of dry RAP for each gradation.
 - d) Recommended water content range as a percent of dry RAP for each gradation used in lab procedure.
 - e) Recommended quantity of the additive (if used) as a percentage by weight of dry RAP for each gradation.
 - f) Compaction apparatus used to form the Marshall test specimens.
 - g) Target values for the emulsified recycling agent used in the CCPRACP mixture for penetration at 77°F and viscosity at 140°F.
 - h) For the emulsified recycling agent and additive (if used), the following shall be provided:

- i) Designation or product name
- ii) Company name and location of manufacture
- iii) Residue content for emulsified recycling agent
- iv) Certificates of compliance with test results.
- i) Process for incorporating the additive (if used).
- j) Preliminary estimates of the time intervals between CCPRACP mixing and compaction relative to ambient temperature.

[End Contractor-prepared mix design inclusion.]

903-2.5 Equipment.

- **903-2.5.1 General.** Equipment includes that for cold milling, crushing and sizing, mixing and proportioning, water storage and supply, cement or lime storage and supply, distribution and spreading, and compaction.
- **903-2.5.2 Cold Milling Machines.** Cold milling machines shall conform to 302-1.2 of the SSPWC.
- **903-2.5.3 Crushing and Screening Equipment.** Crushing and screening equipment shall be capable of producing RAP of the specified size (1 inch minus) before mixing with the emulsified recycling agent, and of routing all oversize material through the crusher and re-screening to the specified size.

903-2.5.4 Mixing and Proportioning Equipment.

903-2.5.4.1 General. Mixing and proportioning equipment shall be capable of producing CCPRACP which conforms to the Specifications. The mixing unit shall be equipped with a belt scale for the continuous weighing of the RAP and a coupled/interlocked computer-controlled liquid metering device. The mixing unit shall be an on-board, completely self-contained counter rotating twin shaft pugmill appropriately rated by the manufacturer for the level of production.

The liquid metering device shall be capable of automatically adjusting the flow of emulsified recycling agent to compensate for any variation in the weight of the RAP introduced into the pugmill. Emulsified recycling agent shall be metered by weight of RAP using a mass flow, coriolis-effect-type meter capable of measuring the amount of emulsified recycling agent to within 0.5 percent of the amount required by the mix design or as adjusted in the field and approved by the Engineer.

Other additives, including water as required, shall be controlled and metered based on the weight of RAP introduced into the pugmill. Additives may be introduced volumetrically or by weight in accordance with the mix design.

Automatic digital readings shall be displayed for both the flow rate and the total amount of RAP, emulsified recycling agent, and additives in appropriate units of weight and time.

Mixing and proportioning equipment shall be calibrated not less than 5 Working Days prior to the start of production. Calibration shall be performed in accordance with California Test 109. Calibration shall only be performed in the presence of the Engineer unless otherwise approved.

903-2.5.4.2 Pugmill. The pugmill shall:

- a) operate continuously using an integrated microprocessor control system to control the weight of RAP being delivered to the mixing chamber;
- b) have automatic controls;
- be equipped with paddles of a type and arrangement to provide sufficient mixing and movement of RAP, emulsified recycling agent, and additives; and
- d) be configured such that no build-up of fines or other segregated material develops, and all materials entering at the feed end of the mixing chamber exit uniformly at the discharge end without clumping or resulting in a non-uniformly mixed mixture.
- **903-2.5.5 Water Storage and Supply Equipment.** The water storage and supply equipment shall be capable of providing an independent water source. The water storage and supply equipment control system shall be interlocked with the mixing and proportioning equipment control system. The water source for the emulsified recycling agent shall be independent of the water source for cement or lime slurry.
- 903-2.5.6 Cement or Lime Storage and Supply Equipment. Cement or lime storage and supply equipment shall be equipped with agitators capable of keeping the cement or lime in suspension during transport or when held in the slurry feed tank.
- **903-2.5.7 Distribution and Spreading.** Distribution and spreading shall be performed by operation of a self-propelled, track-equipped spreading and finishing machine ("track paver") conforming to 302-5.5 of the SSPWC.

The track paver shall be equipped with a fully automatic screed control system which shall be in operation at all times during placement. The system shall be either a contact (skid) or non-contact (sonic averaging) system. The skid shall be a minimum of 30-feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material, and placed in contact with the pavement surface. The sonic averaging system shall have a ski, a minimum of 24 feet long, mounted on the side of the spreading and finishing machine which will receive the next mat of material.

903-2.5.7 Rollers. Rollers shall conform to 302-5.6 of the SSPWC. A minimum of one pneumatic-tired roller weighing 25 tons and one vibratory, double steel drum roller weighing at least 10 tons shall be on the Work site and operated during placement. Rollers shall not be less than 5-1/2 feet wide. Each roller shall have a working water spray system and working scrapers. The number of rollers used shall be consistent with the rate of CCPRACP material being processed and placed.

903-2.6 Quality Control Program.

- **903-2.6.1 General.** The Contractor shall implement a quality control program throughout the production and placement of CCPRACP. The quality control program shall consist of the preparation and implementation of a Quality Control Plan.
- **903-2.6.2 Quality Control Plan (QCP).** The QCP shall prepare and submit in accordance with 2-5.3 and 9-2.2 a QCP which includes the following:
 - a) Name(s) of personnel responsible for quality control and their qualifications.
 - b) Name(s) and qualifications of the independent testing laboratory and staff personnel to be assigned.
 - c) Specific procedures to be following during CCPRACP placement and production.
 - d) The organization, responsible parties, and procedures to address quality control issues, the conditions when corrective actions are needed, and implementation of corrective actions when required.
 - e) The inspection, sampling, testing, and reporting requirements specified in 903-
 - f) A contingency plan for actions that will be taken to ensure that the Work site will be opened to traffic at the end of each Working Day or at the scheduled or specified time of re-opening.
 - g) Equipment list, including manufacturer, model, and evidence of compliance with the requirements of 903-2.5

The QCP shall include a contingency plan describing corrective actions to be taken in the event of equipment breakdown or other delays. Corrective actions shall include repairing the roadway using hot mix asphalt concrete pavement in accordance with 302-5 of the SSPWC and reopening the roadway to traffic at the end of normal working hours. Hot mix asphalt concrete pavement, when required, shall be C2-PG 64-10 conforming to 203-6 of the SSPWC.

The QCP shall contain copies of the forms that will be used to provide all required inspection records and sampling and testing results.

The Contractor shall provide an independent testing laboratory and personnel to perform quality control inspection, sampling, and testing. The testing laboratory and its personnel must be certified by Caltrans. The Engineer shall have unrestricted access to all information resulting from CCPRACP mix design and quality control inspection, sampling, and testing activities.

The Quality Control Plan must be approved by the Agency prior to the start of CCPRACP production and placement.

903-2.6.6 Inspection, Sampling, Testing, and Reporting. The Contractor shall perform quality control inspection, sampling, testing, and reporting as part of its Quality Control Program. The basis of reporting to the Engineer shall be a Lot. A Lot shall be defined as 3,000 square yards or fraction thereof of CCPRACP constructed during the same Day. The CCPRACP mix design information shall be included on the form used to record and report the quality control measurements and calculations.

For each Lot, the Contractor shall measure or calculate, record, and report to the Engineer each Day the following:

- a) The actual recycle depth at each end of the milling drum at least once every 300 feet along the cut length.
- b) Length, width, depth of cut and calculated weight in tons of material processed.
- c) Weight of emulsified recycling agent added in tons.
- d) Percentage of added emulsified recycling agent by weight of the CCPRACP mixture. The amount of emulsified recycling agent shall be within 0.5 percent of the value established in the CIRACP mix design. The percent shall be determined based on the ratio of emulsified recycling agent used to the theoretical dry weight of the RAP processed.
- e) Maximum particle size of the sized RAP prior to the addition of the emulsified recycling agent. If the RAP does not meet the allowable maximum particle size, the test results shall be reported immediately to the Engineer. Re-process the material or take other corrective actions to attain conformance.
- f) Wet field gradation test results for material passing the 1 inch through No. 4 sieves on the first and every fourth sample. Compare the sieved sample to the gradation band determined from the CIRACP mix design and adjust the emulsified recycling agent as needed.
- g) Maximum obtainable density used for relative compaction calculation.
- h) Nuclear gauge in-place density and relative compaction. Perform compaction testing within each Lot at 10 random locations. Relative compaction of the Lot shall be the average of the 10 locations divided by maximum obtainable density obtained in the test strip (as percent). Relative compaction of each of the 10 individual locations must be greater than or equal to 95 percent and less than or equal to 105 percent of the maximum obtainable density obtained in the test strip. Relative compaction of the Lot must be greater than or equal to 97 percent and less than or equal to 103 percent of the maximum obtainable density obtained in the test strip. Re-work or re-process any Lot not in conformance.

- i) Ambient and compacted recycled pavement surface temperatures.
- j) Maximum theoretical density under California Test 309 and void ratio (Report Only). On a daily basis during CCPRACP operations, the Contractor shall take and split a sample of the CCPRACP from a location approved by the Engineer. The samples shall be split into 2 parts and the containers labeled with the location and station. The Contractor shall submit 1 container to the Engineer and use the other for testing. The maximum theoretical density shall be determined in accordance with California Test 309. The maximum theoretical density shall be used to calculate the void ratio for each nuclear gauge site and Lot. The Contractor shall report daily, quality control inspection records and sampling and test results.
- k) 12-foot straightedge measurements, both initial and after corrections
- I) Rate of fog seal coat application.
- m) Rate of sand cover application.

Some sections of the pavement being recycled may require field adjustment for optimum results. The Contractor shall adjust the rate of emulsified recycling agent, additives and water as necessary based on the coating, compaction and breaking properties of the emulsified recycling agent. For any changes made by the Contractor from one Lot to the next, the Contractor shall document the reason for the change and identify each Lot where such changes were made.

A new rolling pattern and a new maximum obtainable density shall be established if any of the following occurs:

- Relative compaction of any of the 10 individual locations is less than 95 percent or greater than 105 percent of the maximum obtainable density obtained in the test strip.
- o) Relative compaction of the Lot is less than 97 percent or greater than 103 percent of the maximum obtainable density obtained in the test strip.
- p) There are changes in RAP, or the CCPRACP mixture or proportions.
- q) There are changes in placement equipment or procedures.
- r) There is a significant change in temperature or weather conditions or other environmental controlling factor.
- s) There is major displacement and/or cracking of the CCPRACP mixture.

Should a change in the rolling pattern or additional rolling produce results that do not meet relative compaction requirements, additional test strips shall be constructed to determine the maximum obtainable density for the CCPRACP mixture being produced, and the rates of emulsified recycling agents, additives, and water for the existing site conditions.

The Contractor shall perform inspection, sampling, and testing at a rate sufficient to ensure that the CCPRACP mixture, placement, compaction and finish surface conform to the Specifications.

The Contractor shall maintain accurate records of all tests it performs as part of its Quality Control Program and shall make these records available to the Engineer upon request. The Contractor shall satisfy itself that its materials and workmanship, including those of its subcontractors and suppliers, are in conformance with the Contract Documents. The Contractor shall submit copies of all Quality Control tests it has performed to the Engineer for review prior to requesting the Agency to perform Quality Assurance testing.

903-2.7 Just-In-Time Training (JITT).

903-2.7.1 General. JITT is a formal joint training class on CCPRACP materials, equipment, placement, compaction methods and quality control. JITT may be conducted as an extension of the Pre-Paving Conference at the Contractor's option. Construction operations for CCPRACP shall not begin until the Contractor's personnel have completed the mandatory training.

903-2.7.2 Class Requirements. The JITT class must be:

- i) At least 2 hours long.
- k) Completed within 7 Days before beginning CCPRACP work.
- I) Conducted during normal working hours.

The following Contractor personnel shall complete JITT:

- m) The Contractor's project manager.
- n) The Contractor's Representative.
- o) The Contractor's paving foreman.
- p) The Contractor's paving equipment operators.
- q) Quality control staff.
- r) Testing technicians.

The following personnel will also be in attendance:

k) The Engineer and other Agency staff.

The training class shall be conducted at a location convenient for both the Contractor and the Engineer. Personnel having attended CCP or CIR JITT in the last 12 months must submit certificates of completion when requesting exemption from attendance.

The JITT instructor shall be provided by the Contractor, and shall be experienced in the construction methods, materials, and test methods associated with construction of CIR or CCP projects. The JITT instructor shall not be an employee of the Contractor, any Subcontractor, or of the Agency. Upon completion of JITT, the instructor shall issue a certificate of completion to the participants.

The Contractor and the Engineer will mutually agree to the course instructor, course content, and training site. Just-In-Time Training shall not relieve the Contractor of responsibility under the Contract for the successful completion of the Work in conformance with the requirements of the Plans and Specifications.

903-2.7.3 Submittals. The Contractor shall submit the following to the Engineer a minimum of 21 Days prior to the scheduled date of the JITT:

- e) Name(s) of instructor(s) and their qualifications and work experience.
- f) Copy of course syllabus, handouts, and presentation materials.
- g) JITT facility location.
- h) Staff name, title, duties/assignment attending the JITT.

903-2.8 Production.

903-2.8.1 General. Production and placement shall neither start nor be performed during wet conditions as determined by the Engineer, or if rain or cold weather (less than 50°F) are forecast within a 48 hour period by the National Weather Service for the most representative and nearest location listed where CCPRACP is to be produced and placed.

The forecast ambient temperature shall be a minimum of 60°F and rising throughout the duration of production and placement operations until initial compaction and protection operations have been completed for that day's run. Production and placement operations shall cease if the actual ambient temperature drops below 60°F any time after the initial 3-hour window following start-up.

Production and placement, including compaction, shall be completed at least 2 hours before sunset.

903-2.8.2 Sequence. The general sequence of production shall be as follows:

- a) Cold milling of streets within the limits of the Work.
- b) RAP crushing and screening.
- c) RAP stockpiling.
- d) Mixing and proportioning.

903-2.8.3 Cold Milling. Cold milling shall conform to 302-1. The existing pavement shall be cold milled to the depth shown on the Plans. The existing pavement shall only be removed by cold milling.

903-2.8.4 Crushing and Screening. RAP shall be crushed and screened to a maximum size of 1 inch, and be free of dirt, base material, concrete or other deleterious materials. Water shall be added during crushing and screening as necessary to abate dust and mitigate reconsolidation.

Paving fabric, if present in the crushed and screened RAP, shall not exceed 2 inches in any dimension. Oversized pieces of paving fabric shall be removed and properly disposed of.

Inductive loop detector wires, pavement markers, rubberized crack filler and sealer materials, thermoplastic striping and pavement marking materials, Portland cement concrete, and other incompatible materials shall be removed from the RAP prior to stockpiling.

- **903-2.8.5 Stockpiling.** Crushed and screened RAP shall not be stockpiled for longer than 10 Days or in stockpiles greater than 15 feet in height.
- **903-2.8.6 Mixing and Proportioning.** The total water content shall include that amount present in the RAP in the stockpile and additional mixing water added at the pugmill, if required. Cement and lime slurry shall be added directly into the pugmill or sprayed over the cold milling equipment cutting teeth.

Adjustments in the rate of emulsified recycling agent, additives and water shall be made as necessary based on the coating, compaction and breaking properties of the emulsified recycling agent. Sampling variations and the approved mix design(s) may determine the necessity of different levels of emulsified recycling agent and/or additives in various sections of the Project.

On a daily basis during CCPRACP production, the Contractor shall take and split a sample of the CCPRACP from the cold central plant. The samples shall be split into 2 parts and the containers labeled with location and station. The Contractor shall submit 1 container to the Engineer and use the other for testing. The maximum theoretical density shall be determined in accordance with California Test 309. The maximum theoretical density shall be used to calculate void ratio for each nuclear gauge site and Lot. The Contractor shall report daily, quality control inspection records and sampling and test results.

Cement or lime may be introduced directly into the pugmill by weight of RAP in accordance with the approved mix design. The Contractor shall provide the Engineer with daily batch logs.

903-2.9 Placement.

903-2.9.1 Sequence. The general sequence of placement shall be as follows:

- a) Pre-Paving Conference.
- b) Establish a Production Verification Day.
- c) Spread and perform initial compaction
- d) Apply flush coat.
- e) Curing and protection.
- f) Perform supplemental compaction.

903-2.9.2 Pre-Paving Conference. The pre-paving conference will be arranged by the Engineer within 5 Working Days prior to the scheduled start of placement. The Contractor's Representative, the Contractor's paving foreman, materials suppliers, and representatives of the Agency's Materials Laboratory shall attend the meeting. The following will be discussed:

- a) Equipment.
- b) Rate of production, delivery, and placement.
- c) Production and Placement Verification Day (PPVD).
- d) Contractor quality control program implementation.
- e) Agency quality assurance.
- f) Traffic control.
- g) Other topics as may be proposed.

903-2.9.5 Spreading and Finishing. The CCPRACP mixture shall be spread in one continuous pass without segregation to the lines and grades shown on the Plans. The wings of the paver shall be emptied regularly to minimize segregation as well as to prevent buildup.

The processed CCPRACP may be windrowed or placed directly into the hopper of the paving machine. If windrowed, the asphalt paver loading equipment shall be capable of picking up and depositing the CCPRACP into the spreading machine in a single pass.

Handwork shall be minimized while spreading. The Contractor shall mitigate any particle segregation, tearing, or scarring of the compacted CCPRACP as approved by the Engineer.

A single lift thickness shall be at a minimum compacted depth of 3 inches and not exceed a maximum compacted depth of 4 inches.

Based on the ambient temperatures, weather conditions, and type of emulsified recycling agent used, the Contractor shall determine and record the time intervals between spreading and compacting of the CCPRACP. The final time interval shall be recorded in the daily quality control documents.

The smoothness of the finished surface shall be checked regularly during placement using a 12-foot long straightedge level. The smoothness shall not vary more than 3/8-inch from a 12-foot straight edge placed on the surface. Areas that vary from the lower edge of more than 0.01 foot when the straight edge is laid parallel with the centerline, or more than 0.02 foot when the straightedge is laid perpendicular to the centerline and extend from edge to edge of a traffic lane shall be corrected by reworking, re-compaction, or removal and replacement. The correction method chosen by the Contractor must be approved by the Engineer before starting any corrective work. Corrected CCPRACP areas must be uniform rectangles with edges that are parallel to the nearest existing pavement edge or lane line; or perpendicular to the pavement centerline.

903-2.9.6 Compaction.

903-2.9.6.1 General. CCPRACP shall be compacted such that the final, compacted, CIRACP surface conforms to the depth, lines, and grades shown on the Plans. Areas inaccessible to rollers shall be compacted to the required density by other equipment approved by the Engineer.

The Contractor shall perform compaction testing as part of its Quality Control Plan. The Agency will perform such quality assurance compaction testing as the Engineer deems necessary to correlate to and verify the Contractor's testing.

903-2.9.6.2 Initial Compaction and Initial In-Place Density. Initial compaction operations shall start no more than 15 minutes behind the track paver or at the direction of the Engineer.

The Contractor shall follow the selected rolling pattern established in 903-2.10 unless changes in production and placement occur and a new rolling pattern is requested by the Contractor and approved by the Engineer.

The minimum rolling pattern shall be as follows:

- a) Two (2) complete coverings with the double drum steel vibratory roller immediately after placement. The first coverage shall be made without the vibratory unit turned on and the second with the vibratory unit operating.
- b) Two (2) complete coverings with the pneumatic-tired roller shall be made after the initial passes of the steel roller.
- c) One complete covering, before curing, with the double drum steel vibratory roller in static or vibratory mode to eliminate pneumatic tire marks and to achieve maximum density.

A rolling pattern for compaction shall be determined such that no increase in density is shown on successive nuclear density tests performed in accordance with ASTM D2950 for any additional passes of the compaction equipment once the maximum density pattern has been identified ("break over point"). Nuclear density testing shall be repeated throughout the time compaction is being completed to continuously verify maximum

density results by establishing a rolling vs. density chart that shows the progress of densification from initial breakdown compaction through maximum obtainable density at the break over point.

The Contractor shall continuously observe the compaction of the CCPRACP. Rolling shall neither be started nor stopped on material which has not been fully compacted. Rolling shall be established so that the starting and stopping shall be on previously compacted material.

The Contractor shall ensure that aggregate does not stick to the drums or tires of the rollers. Water shall be uniformly applied to the wheels and drums by automatic, mechanical means. Sufficient water shall be applied to the drums and tires as is necessary to keep them clean, but not result in ponding on the pavement surface.

Rolling which results in cracking, major displacement, and/or any other type of pavement distress shall be discontinued until such time as the problem can be resolved. Cessation and resumption of rolling operations shall be at the discretion of the Engineer.

If moisture cracking occurs during the vibratory compaction mode, the vibrators shall be turned off and static rolling only performed. If moisture cracking continues under static rolling, steel drum roller compaction shall cease, the mat shall be allowed to further cure, and pneumatic rolling commenced, followed by steel drum rolling to iron out irregularities from the rubber-tired roller(s). This procedure shall be followed until displacement of the mat is no longer observed.

Corrected CCPRACP areas must be uniform rectangles with edges that are parallel to the nearest existing pavement edge or lane line; or perpendicular to the pavement centerline.

903-2.10 Production and Placement Verification Day (PPVD).

903-2.10.1 General. The PPVD is the one Day of production and placement that demonstrates the Contractor's capability to produce and place CCPRACP in conformance with the Plans and Specifications for the remainder of the Work.

One Day of production shall be considered as a minimum of production of 1500 tons of CCPRACP. One Day of placement shall be considered as placement of a minimum of 8,000 linear feet at a width of one lane. One lane shall be considered a minimum of 10 feet. The area paved during the PPVD may be incorporated into the Work if production and placement conforms to the Plans and Specifications.

PPVD placement shall be located such that the resultant pavement does not need to be opened to traffic immediately upon completion of rolling operations. The Contractor shall not open the CCPRACP until the Contractor demonstrates the requirements set forth in these special provisions are met.

The Contractor shall perform the following on the PPVD:

- a) Demonstrate that the production and placement equipment, materials, processes, and proposed job mix formula (mix design) is capable of producing and constructing CCPRACP that conforms to the requirements of these Special Provisions:
- b) Establish the optimal rates for emulsified recycling agents, additives, and water recommended for the reclaimed asphalt pavement;
- c) Establish the sequence and manner of rolling necessary to achieve the maximum obtainable density using a compaction rolling pattern developed in the field by the Contractor and reviewed by the Engineer. A rolling pattern for compaction is defined such that no increase in density is achieved on successive nuclear density tests for any additional passes of the compaction equipment once the maximum density pattern has been identified ("breakover point"). The Contractor shall prepare a rolling vs. density chart that shows the progress of densification from initial lay down through maximum obtainable density at the "break over point."
- d) Determine the relative compaction on the CCPRACP by performing nuclear gage density testing in accordance with ASTM D2950. If the relative compaction tests obtained in PPVD do not meet the density requirements of these Special Provisions, the Contractor shall construct additional test strips to define the maximum density obtainable for the RAP millings being produced; the rates of emulsified recycling agents, additives, and water; and site conditions.

Upon completion of PPVD, the Contractor shall provide a report to the Engineer with the following information:

- e) Length, width, depth, and calculated weight in tons of CCPRACP material processed and placed.
- f) Weight of emulsified recycling agent added in tons.
- g) Percentage of added emulsified recycling agent in the CCPRACP mixture by weight.
- h) Percentage of recycling additive in the CCPRACP mixture by weight.
- Maximum particle size of the RAP before the addition of the emulsified recycling agent.
- j) Maximum obtainable density used for relative compaction calculation.
- k) Nuclear gauge in-place density and relative compaction every 250 feet along the entire length constructed on PPVD.
- I) A rolling vs. density chart that shows the progress of densification from initial laydown through maximum obtainable density at the "break over point".

- m) Ambient and compacted surface temperatures.
- **903-2.10.2 Approval**. After the Contractor successfully demonstrates compliance with the Plans and Specifications during the PPVD, the Engineer will allow production and placement to proceed for the remainder of the Work. Approval by the Engineer to proceed shall not relieve the Contractor of its responsibility to comply with the Plans and Specifications for remainder of the Work. The Contractor shall perform additional adjustments as necessary to ensure compliance with the Plans and Specifications. The Engineer shall be informed of such adjustments and such adjustments shall be subject to the approval of the Engineer.

If the production and/or placement on the PPVD does not conform to the Plans and Specifications, the Contractor shall determine the corrective actions to be taken, discuss these adjustments or changes with the Engineer, and obtain approval from the Engineer before proceeding to re-work, re-compact, or remove and replace the CCPRACP at the Contractor's expense.

The Contractor shall use the same types of equipment, materials, and construction methods for the remainder of production and placement. Changes in equipment, materials and construction methods shall be approved by the Engineer.

- 903-2.11 Fog Seal Coat and Rock Dust Blotter Cover. After initial compaction, and prior to opening to traffic, the Contractor shall apply a fog seal coat to the CCPRACP surface which shall be composed of emulsified asphalt diluted with water at a ratio not to exceed 1:1 unless otherwise approved by the Engineer. The application rate of the fog seal coat shall be between 0.08 and 0.12 gallon per square yard. Immediately following application of the fog seal, the CCPRACP surface shall be covered with rock dust blotter at a rate of 1.0 to 2.0 pounds per square yard. The exact rate shall be determined by the Contractor. Excess rock dust blotter shall be removed from the pavement surface by sweeping.
- **903-2.12 Curing, Protection, and Maintenance**. CCPRACP shall be cured in-place either for a minimum of 2 Days and until the percent moisture at the mid-depth of the CCPRACP is less than 2 percent, or for a minimum of 10 Days without rainfall.

The Contractor shall protect and maintain the CCPRACP free from nuisance water, other deleterious substances, and/or any other damage. Any damage shall be repaired by the Contractor prior to placement of the surface course or final surface seal coat. Areas damaged shall be excavated to the depth directed by the Engineer and/or filled and compacted with new C2-PG 64-10 asphalt concrete conforming to 203-6. Loose particles on the pavement surface shall be removed by sweeping prior to placement of the surface course or final seal coat.

903-2.13 Supplemental Compaction. Supplemental compaction shall be conducted after the CCPRACP has cured and prior to any smoothness testing or placement of the surface course or final seal coat. During supplemental compaction operations, the basis of reporting compaction test results to the Engineer shall be by Lot in accordance with 903-2.6.

On the first Day of supplemental compaction operations, the Contractor shall designate a section of the CCPRACP as a test strip. The test strip shall be a single lane width wide and at least 1,500 feet in length. The test strip must demonstrate the sequence and methods of rolling necessary to achieve the maximum obtainable density during final rolling. A rolling pattern for supplemental compaction is defined as that which results when no further increase in density is achieved on successive nuclear density tests for any additional passes of the compaction equipment once the maximum density pattern has been identified ("break over point").

The final compacted surface shall be free of ruts, bumps, indentations, raveling, irregularities, or segregation and conform to the smoothness requirements specified in 903-2.9.5.

903-2.14 Measurement.

[Include the following if the basis of measurement is "square yard for each thickness:"]

CCPRACP will be measured by the square yard of finished surface for each thickness shown on the Plans. CCPRACP placed outside the limits shown on the Plans will not be measured for payment. PPVD placement conforming to the requirements of these Special Provisions will be included in the quantity measured.

[End "square yard" inclusion.]

[Include the following if the basis of measurement is "ton:"]

CCPRACP will be measured by the ton. The Contractor shall furnish the Engineer with a certified weighmaster certificate for each load placed on the Work. The Contractor shall furnish and utilize certified portable scales. CCPRACP placed outside the limits shown on the Plans will not be measured for payment. PPVD placement conforming to the requirements of these Special Provisions will be included in the quantity measured.

[End "ton" inclusion.]

Emulsified recycling agent will be measured by the ton. The basis of payment shall be the net weight of emulsified recycling agent used to produce CCPRACP. *The quantity in the Bid is based on a content of ____ percent.* The Contractor shall furnish the Engineer with certified weighmaster certificates showing the weight of each load delivered to the Work site and the weight remaining on the Work site after completion. Payment will be made for the difference between the weight delivered to the Work site and the weight remaining on the Work site after completion of CCPRACP production.

903-9.15 Payment.

[Include the following if the Contractor prepared the mix design:]

The lump sum price in the Bid for "CCPRACP MIX DESIGN, SAMPLING, AND TESTING" shall be considered full compensation for all work necessary to develop the CCPR mix design(s), and to perform all sampling and testing, determine gradations, obtain measurements, record test results, and prepare and submit mix designs.

[End Contractor-prepared mix design payment inclusion.]

[Include the following if the basis of measurement is "square yard for each thickness:"]

Payment for CCPRACP will be made at the Contract Unit Price for "CCP AC PAVEMENT, 3" THICK."

[End "square yard" inclusion.]

[Include the following if the basis of measurement is "ton:"]

Payment for CCPRACP will be made at the Contract Unit Price for "CCP AC PAVEMENT."

[End "ton" inclusion.]

The Contract Unit Price shall include preparing and implementing a quality control program, PPVD, JITT including payment for the instructor and training materials, importing additional RAP as may be required, producing and placing CCPRACP, fog seal coat and rock dust blotter, curing, protection and maintenance of the CCPRACP, and other incidental and appurtenant work for which no separate Bid item is listed in the Bid.

No separate payment will be made for corrective work.

The Contract Unit Price in the Bid for "EMULSIFIED RECYCLING AGENT" shall be considered full compensation for furnishing and incorporating the emulsified recycling agent into the CCPRACP. The provisions of 3-2.2.2 and 3-2.2.3 of the SSPWC shall not apply to this Bid Item.

SECTION 904 - POLYMER MODIFIED EMULSION (PME) CHIP SEAL

904-1 GENERAL. PME chip seal shall consist of the application of polymer modified emulsion, screenings, and a flush coat to existing roadway pavement.

904-2 MATERIALS.

904-2.1 Polymer Modified Emulsion (PME).

904-2.1.1 General. PME shall be PMCRS-2h conforming to the requirements shown in Table 904-2.1.1.

TABLE 904-2.1.1

TABLE 304-2.1.1										
Type		Anionic			Cationic					
Grade		PMRS-2 PMRS-2h		PMCRS-2		PMCRS-2h				
Properties			min	max	min	max	min	max	min	max
Tests on emulsions:	Test Me	thod								
Saybolt Furol Viscosity, @ 50 °C, SFS 1			75	300	75	300	75	300	75	300
Settlement, 5 days, %				5	ŀ	5		5	1	5
Storage Stability, 1 day, %	AASHTO	D T 59		1		1		1		1
Sieve Test, %				0.30	ŀ	0.30		0.30	1	0.30
Demulsibility, %			60^{2}		60^{2}		40 ³	-	40 ³	
Particle Charge			-	-	•	-	Positive		Positive	
Ash Content, %	ASTM D	3723		0.2	ŀ	0.2		0.2	1	0.2
Residue by Evaporation, %	Californi 331	a Test	65		65	1	65	1	65	
Test on Residue from Evaporation test:	Californi 331	ifornia Test								
Penetration, 25°C	AASHTO	OT 49	100	200	40	90	100	200	40	90
Ductility, 25°C, mm	AASHTO	D T 51	400		400		400		400	
and either:										
Torsional recovery, %	Californi 332	a Test	18		18		18		18	
or										
Polymer Content, 5% (by weight) ⁴	Californi 401	a Test	2.5		2.5		2.5		2.5	

Notes:

- 1. Means Saybolt Furol seconds.
- 2. Use 35 ml of 0.02 N CaCL₂ solution.
- 3. Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.
- 4. Sample asphaltic emulsion under AASHTO T 40. Store samples in clean and airtight sealed containers. Storage temperature must be at least 40 °F until tested.

904-2.1.2 Certificate of Compliance. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall accompany each shipment of PME to the Work site and be submitted to the Engineer. In addition to the requirements of 4-1.5, the certificate shall show the shipment number, type of material, refinery, consignee, destination, quantity, Project title, purchase order number, and date of shipment.

PME shipped without a Certificate of Compliance will not be allowed to be used on the Work.

904-2.2 Screenings.

904-2.2.1 General. Screenings shall conform to 200-1.2.2 of the SSPWC except the "Percentage Wear (500 revolutions)" requirement shown in Table 200-1.2.2.1 shall be 45 maximum.

The screenings size shown on the Plans denotes the seal coat type shown in Table 200-1.2.2.2.

904-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings. The Contractor may, at its option, furnish and apply screenings produced from RAP. RAP screenings shall be produced by crushing asphalt concrete pavement, be free of detrimental quantities of deleterious materials, and have a minimum sand equivalent of 80 when tested in accordance with California Test 217. Conformance to the requirements shown in Table 200-1.2.2.1 of the SSPWC is not required. Grading shall conform to the requirements shown in Table 200-1.2.2.2.

904-2.3 Flush Coat.

- **904-2.3.1 Emulsified Asphalt.** Emulsified asphalt for fog seal coat shall be CQS-1h conforming to 203-3 of the SSPWC which may be diluted up to 50 percent with water. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.
- **904-2.3.2 Sand.** Sand for sand cover shall be sand for Portland cement concrete conforming to 200-1.5.3 of the SSPWC. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.
 - **904-3 EQUIPMENT.** Equipment shall conform to 302-2.3 of the SSPWC.
- **904-4 ROADWAY SURFACE PREPARATION.** Roadway surface preparation shall conform to 302-2.4 of the SSPWC.
- **904-5 TEMPORARY TRAFFIC CONTROL.** Temporary traffic control shall conform to 302-2.5 of the SSPWC and 601 of Section TTC.

904-6 APPLICATION AND SPREADING.

904-6.1 General. Application and spreading shall only be performed when the pavement is clean and dry, wind conditions are such that uniform coverage will result, and rain is not imminent.

904-6.2 Polymer Modified Emulsified Asphalt (PME). Application of PME shall conform to 302-2.6.2 of the SSPWC and the following:

PME shall not be applied:

- a) until sufficient screenings are on hand to immediately cover the PME, or
- b) more than 500 feet ahead of completed initial rolling.

The Contractor shall schedule PME application such that the PME breaks (turns from brown to black) before:

- c) the atmospheric temperature falls below 55°F,
- d) the pavement temperature falls below 60°F, and
- e) the time the lane is to be opened to public traffic.

PME shall be applied to only one designated traffic lane at a time, and the full-width shall be covered in one operation.

The initial rate of application shall be 0.30 gallon per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall apply PME to 100-foot test strips to assist in determination. The initial rate, and any adjustments thereto during application, shall be subject to approval by the Engineer.

After application, PME shall completely and uniformly cover the underlying pavement and be free of streaks and voids.

904-6.3 Screenings. Spreading of screenings shall conform to 302-2.6.4 of the SSPWC and the following:

If screenings are stockpiled, any testing that may be performed by the Agency at the plant prior to stockpiling shall only be for the purpose of approving delivery to the Work site. Screenings not conforming to the requirements of the Contract Documents shall not be delivered to the Work site regardless of whether the Agency performs such testing. The Agency will perform testing on the stockpiled screenings, the results of which will determine if the screenings represented by such testing may be used in the Work.

Spreading shall begin immediately following application of the PME. **The initial rate** of spreading shall be 22 pounds per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall spread screenings on 100-foot test strips at different rates to aid in determination. The initial rate shall be adjusted up or down as necessary to provide complete and uniform coverage over the PME and ensure that no bleeding occurs during rolling. The initial rate, and any adjustments thereto during spreading, shall be subject to approval by the Engineer.

- **904-7 FINISHING.** Finishing shall conform to 302-2.7 of the SSPWC.
- **904-8 FLUSH COAT.** Flush coat shall conform to 302-2.8 of the SSPWC and the following:

Emulsified asphalt shall be applied at a rate of *0.03 to 0.06 gallon per square yard*. The exact application rate shall be recommended by the Contractor and approved by the Engineer.

Sand shall be spread at a rate of 1 to 2 pounds per square yard. The exact spread rate shall be recommended by the Contractor and approved by the Engineer.

- **904-9 MAINTENANCE.** Maintenance shall conform to 302-2.9 of the SSPWC.
- **904-10 MEASUREMENT.** PME chip seal coat will be measured by the square yard. Measurement will be made in accordance with 302-2.10 of the SSPWC.
- **904-11 PAYMENT.** Payment shall conform to 302-2.11 of the SSPWC and the following.

Payment for PME chip seal coat will be made at the Contract Unit Price per square yard for "POLYMER MODIFIED EMULSION CHIP SEAL" for each seal coat type.

No additional payment will be made for increases in the application rate of PME or screenings ordered by the Engineer

SECTION 905 - ASPHALT REJUVENATING EMULSION (ARE) CHIP SEAL

- **905-1 GENERAL.** ARE chip seal shall consist of the application of asphalt rejuvenating emulsion, screenings, and a flush coat to existing roadway pavement.
 - 905-2 MATERIALS.
 - 905-2.1 Asphalt Rejuvenating Emulsion (ARE).
- **905-2.1.1 General.** ARE shall be emulsified asphalt containing a latex polymer and a rejuvenating agent. ARE shall conform to the requirements shown in Table 905-2.1.1.

TABLE 905-2.1.1

Test on Emulsion	Test Method	Specification
Viscosity @ 122°F (SFS)	ASTM D244	50 – 400
Residue, w%, min.	ASTM D244	65
рН	ASTM E70	2.0-5.0
Sieve, w%, max.	ASTM D244	0.1
Oil distillate, w%, max.	ASTM D244	0.5
Test on Residue ⁽¹⁾		
Viscosity @ 140°F, Poises, max.	ASTM D2171	5000
Penetration @ 39.2°F, min.	ASTM D5	40
Elastic Recovery on residue by distillation, %, min.	AASHTO T59 ^(1,2) , T301	45
Test on Latex		
Specific Gravity, min.	ASTM D1475	1.08
Tensile Strength, die C dumbbell, psi, min.	ASTM D412 ⁽³⁾	500
Swelling in rejuvenating agent, % max.; 48 hours exposure @ 104°F	ASTM D471 ⁽⁴⁾ Modified	40% intact film
Test on Rejuvenating Agent		
Flash point, COC , °F	ASTM D92	> 380
Hot Mix Recycling Agent Classification	ASTM D4552	See Table 601-2.1.2 (A)

⁽¹⁾ Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly to 350°F ± 10°F. Maintain at this temperature for 20 minutes. Complete total distillation in 60 ± 5 minutes from first application of heat

(2) Elastic Recovery @ 50°F: Hour glass sides, pull 20 cm, hold 5 minutes then cut, let sit 1 hour.

⁽⁴⁾ Latex Testing: Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section. Polymer film shall be prepared from latex as follows:

Resistance to Swelling: Polymer films shall be formed by using a 50 mil drawdown bar and drawing down 50 mils of the latex on polyethylene boards. Films shall be cured for 14 days at 75°F and 50% humidity. Samples for resistance to swelling in rejuvenating agent shall be 1" by 2" rectangles cut from the cured film. Cut at least 3 specimens for each sample to be tested for swelling. Fill 3-8 oz ointment tins with at least a ½" deep of rejuvenating agent. Swelling samples shall be weighed and then placed in the ointment tins on top of the rejuvenating agent. Then, add at least another ½" deep of rejuvenating agent over each of the latex samples. The ointment tins shall be covered and placed in an oven at 104°F for the specified 48 hours ±15 minutes. The ointment tins are allowed to cool to 75°F and then the latex films are removed from the tins. Unabsorbed rejuvenating agent is removed from the intact latex film by scraping with a rubber policeman and blotting with paper towers. If the latex film does not remain intact during removal from the tins or while removing the unabsorbed rejuvenating agent the sample shall be rejected. After the rejuvenating agent is removed from the samples they are then weighed. Percent swelling is reported as weight increase of the polymer film; report mass increase as a percent by weight of the original latex film mass upon exposure of films to the recycling agent.

⁽³⁾ Tensile strength determination: Latex films shall be cured at 75°F and 50% relative humidity for 14 Days prior to cutting or molding specimens. Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section.

905-2.1.2 Rejuvenating Agent. Rejuvenating agent shall conform to the requirements shown in Table 905-2.1.2.

TABLE 905-2.1.2

Test	Requirements
Viscosity, 140°F, CST	50-175
Flash Point, °F, COC	380 Min.
Saturate, % by wt.	30 Max.
Asphaltenes	1.0 Max.
Test on Residue	
Weight Change, %	6.5 Max.
Viscosity Ratio	3 Max.

905-2.1.3 Polymer. The polymer shall be PA-AS-1 as produced by Polymer Science of America, or Agency-approved equal.

905-2.1.4 Certificate of Compliance. A Certificate of Compliance conforming to 4-1.5 shall accompany each shipment of ARE to the Work site and be submitted to the Engineer. In addition to the requirements of 4-1.5, the certificate shall show the shipment number, type of material, refinery, consignee, destination, quantity, Project title, purchase order number, and date of shipment.

ARE shipped without a Certificate of Compliance will not be allowed to be used on the Work.

905-2.2 Screenings.

905-2.2.1 General. Screenings shall conform to 200-1.2.2 of the SSPWC except the "Percentage Wear (500 revolutions)" requirement shown in Table 200-1.2.2.1 shall be 45 maximum.

The screenings size shown on the Plans denotes the seal coat type shown in Table 200-1.2.2.2.

905-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings. The Contractor may, at its option, furnish and apply screenings produced from RAP. RAP screenings shall be produced by crushing asphalt concrete pavement, free of detrimental quantities of deleterious materials, and have a minimum sand equivalent of 80 when tested in accordance with California Test 217. Conformance to the requirements shown in Table 200-1.2.2.1 of the SSPWC is not required. Grading shall conform to the requirements shown in Table 200-1.2.2.2.

905-2.3 Flush Coat.

905-2.3.1 Emulsified Asphalt. Emulsified asphalt for fog seal coat shall be CQS-1h conforming to 203-3 of the SSPWC which may be diluted up to 50 percent with water. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.

- **905-2.3.2 Sand.** Sand for sand cover shall be sand for Portland cement concrete conforming to 200-1.5.3 of the SSPWC. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.
 - **905-3 EQUIPMENT.** Equipment shall conform to 302-2.3 of the SSPWC.
- **905-4 ROADWAY SURFACE PREPARATION.** Roadway surface preparation shall conform to 302-2.4 of the SSPWC.
- **905-5 TEMPORARY TRAFFIC CONTROL.** Temporary traffic control shall conform to 302-2.5 of the SSPWC and 601 of Section TTC.

905-6 APPLICATION AND SPREADING.

- **905-6.1 General.** Application and spreading shall only be performed when the pavement is clean and dry, wind conditions are such that uniform coverage will result, and rain is not imminent.
- **905-6.2 Asphalt Rejuvenating Emulsion (ARE).** Application of ARE shall conform to 302-2.6.2 of the SSPWC and the following:

ARE shall not be applied:

- a) until sufficient screenings are on hand to immediately cover the ARE,
- b) more than 500 feet ahead of completed initial rolling.

The Contractor shall schedule ARE application such that the ARE breaks (turns from brown to black) before:

- c) the atmospheric temperature falls below 50°F,
- d) the pavement temperature falls below 60°F, and
- e) the time the lane is to be opened to public traffic.

ARE shall be applied to only one designated traffic lane at a time, and the full-width shall be covered in one operation.

The initial rate of application shall be 0.30 gallon per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall apply ARE to 100-foot test strips to assist in determination. The initial rate, and any adjustments thereto during application, shall be subject to approval by the Engineer.

After application, ARE shall completely and uniformly cover the underlying pavement and be free of streaks and voids.

905-6.3 Screenings. Spreading of screenings shall conform to 302-2.6.4 of the SSPWC and the following:

If screenings are stockpiled, any testing performed by the Agency at the plant shall only be considered as preliminary. Screenings not conforming to the requirements of the Contract Documents shall not be delivered to the Work site. The Agency will perform subsequent testing on the stockpiled screenings to determine if they are in conformance with the requirements of the Contract Documents and may be used in the Work.

Spreading shall begin immediately following application of the ARE. *The initial rate of spreading shall be 24 pounds per square yard*. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall spread screenings on 100-foot test strips at different rates to aid in determination. The initial rate shall be adjusted up or down as necessary to provide complete and uniform coverage over the ARE and ensure that no bleeding occurs during rolling. The initial rate, and any adjustments thereto during spreading, shall be subject to approval by the Engineer.

- 905-7 FINISHING. Finishing shall conform to 302-2.7 of the SSPWC.
- 905-8 FLUSH COAT. Flush coat conform 302-2.8 of the SSPWC and the following:

Emulsified asphalt shall be applied at a rate of *0.03 to 0.06 gallon per square yard*. The exact application rate shall be recommended by the Contractor and approved by the Engineer.

Sand shall be spread at a rate of **1 to 2 pounds per square yard**. The exact spread rate shall be recommended by the Contractor and approved by the Engineer.

- 905-9 MAINTENANCE. Maintenance shall conform to 302-2.9 of the SSPWC.
- **905-10 MEASUREMENT.** ARE chip seal coat will be measured by the square yard. Measurement will be made in accordance with 302-10 of the SSPWC.
- **905-11 PAYMENT.** Payment shall conform to 302-2.11 of the SSPWC and the following:

Payment for ARE chip seal coat will be made at the Contract Unit Price per square yard for "ASPHALT REJUVENTATING CHIP SEAL" for each type of chip seal coat.

No additional payment will be made for increases in the application rate of ARE or screenings ordered by the Engineer.

SECTION 906 – SCRUB SEAL COAT

906-1 GENERAL. Scrub seal coat shall consist of an application or applications of asphalt rejuvenating emulsion and screenings on existing roadway pavement.

906-2 MATERIALS.

906-2.1 Asphalt Rejuvenating Emulsion (ARE).

906-2.1.1 General. ARE shall be a modified emulsion containing a latex polymer, and a rejuvenating agent. ARE shall conform to the requirements shown in Table 906-2.1.1.

TABLE 906-2.1.1

Test on Emulsion	Test Method	Specification
Viscosity @ 122°F (SFS)	ASTM D244	50 – 400
Residue, w%, min.	ASTM D244	65
Ph	ASTM E70	2.0-5.0
Sieve, w%, max.	ASTM D244	0.1
Oil distillate, w%, max.	ASTM D244	0.5
Test on Residue ¹		
Viscosity @ 140°F, Poises, max.	ASTM D2171	5000
Penetration @ 39.2°F, min.	ASTM D5	40
Elastic Recovery on residue by distillation, %, min.	AASHTO T59 ^{1,2} , T301	45
Test on Latex		
Specific Gravity, min.	ASTM D1475	1.08
Tensile Strength, die C dumbbell, psi, min.	ASTM D412 3	500
Swelling in rejuvenating agent, % max.; 48 hours	ASTM D471 ⁴	40%
exposure @ 104°F	Modified	intact film
Test on Rejuvenating Agent		
Flash point, COC , °F	ASTM D92	> 380
Hot Mix Recycling Agent Classification	ASTM D4552	See Table 601-2.1 (B)

Notes:

- 1. Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly to $350^{\circ}F \pm 10^{\circ}F$. Maintain at this temperature for 20 minutes. Complete total distillation in 60 ± 5 minutes from first application of heat.
- 2. Elastic Recovery @ 50°F: Hour glass sides, pull 20 cm, hold 5 minutes then cut, let sit 1 hour.
- 3. Tensile strength determination: Latex films shall be cured at 75°F and 50% relative humidity for 14 days prior to cutting or molding specimens. Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section.
- 4. Latex Testing: Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section. Polymer film shall be prepared from latex as follows:

Resistance to Swelling: Polymer films shall be formed by using a 50 mil drawdown bar and drawing down 50 mils of the latex on polyethylene boards. Films shall be cured for 14 days at $75^{\circ}F$ and 50% humidity. Samples for resistance to swelling in rejuvenating agent shall be 1" by 2" rectangles cut from the cured film. Cut at least 3 specimens for each sample to be tested for swelling. Fill 3-8 oz ointment tins with at least a $\frac{1}{2}$ " deep of rejuvenating agent. Swelling samples shall be weighed and then placed in the ointment tins on top of the rejuvenating agent. Then, add at least another $\frac{1}{2}$ " deep of rejuvenating agent over each of the latex samples. The ointment tins shall be covered and placed in an oven at $104^{\circ}F$ for the specified 48 hours \pm 15 minutes. The ointment tins are allowed to cool to $75^{\circ}F$ and then the latex films are removed from the tins. Unabsorbed rejuvenating agent is removed from the intact latex film by scraping with a rubber policeman and blotting with paper towers. If the latex film does not remain intact during removal from the tins or while removing the unabsorbed rejuvenating agent the sample shall be rejected. After the rejuvenating agent is removed from the samples they are then weighed. Percent swelling is reported as weight increase of the polymer film; report mass increase as a percent by weight of the original latex film mass upon exposure of films to the recycling agent.

906-2.1.2 Rejuvenating Agent. Rejuvenating agent shall conform to Table 906 2.1.2.

TABLE 900-2.1.2			
Test	Requirements		
Viscosity, 140°F, CST	50-175		
Flash Point, °F, COC	380 Min.		
Saturate, % by wt.	30 Max.		
Asphaltenes	1.0 Max.		
Test on Residue			
Weight Change, %	6.5 Max.		
Viscosity Ratio	3 Max.		

TABLE 906-2.1.2

906-2.1.3 Polymer. The polymer shall be PA-AS-1 as produced by Polymer Science of America or Agency-approved equal.

906-2.1.4 Certificate of Compliance. A Certificate of Compliance conforming to 4-1.5 shall accompany each shipment of ARE to the Work site and be submitted to the Engineer prior to application. In addition to the requirements of 4-1.5 of the SSPWC, the certificate shall show the shipment number, type of material, refinery, consignee, destination, quantity, Project title, purchase order number, and date of shipment.

ARE shipped without a Certificate of Compliance will not be allowed to be used on the Work unless otherwise approved by the Engineer.

906-2.2 Screenings.

906-2.2.1 General. Screenings shall conform to 200-1.2.2 of the SSPWC except the "Percentage Wear (500 revolutions)" requirement shown in Table 200-1.2.2.1 shall be 45 maximum.

The screenings size shown on the Plans denotes the seal coat type shown in Table 200-1.2.2.2.

Screenings shall be "Medium Fine" as shown in Table 200-1.2.2.2 unless otherwise shown on the Plans.

- 906-2.2.2 Reclaimed Asphalt Pavement (RAP) Screenings. The Contractor may, at its option, furnish and apply screenings produced from RAP. RAP screenings shall be produced by crushing asphalt concrete pavement, free of detrimental quantities of deleterious materials, and have a minimum sand equivalent of 80 when tested in accordance with California Test 217. Conformance to the requirements shown in Table 200-1.2.2.1 of the SSPWC is not required. Grading shall conform to the requirements shown in Table 200-1.2.2.2.
- **906-3 EQUIPMENT.** Equipment shall conform to 302-2.3 of the SSPWC and the following:

Scrub brooms shall be composed of a rigid steel frame with hydraulically operated street brooms attached. The main body of the frame shall be a minimum of 8 feet wide by 8 feet long. The minimum frame width shall be 16 feet. The maximum transverse width of the frame at any point shall not exceed 4 feet. The nearest and furthest members, paralleling the back of the distributor truck, and the diagonal members shall be equipped with street brooms. The leading member and the trailing member shall have broom heads angled at 15 degrees off the centerline of the supporting member. The diagonal members shall have broom heads attached in line with the centerline of the supporting member. Each individual street broom attached to the scrub broom assembly shall be 3-1/2 inches wide x 8 inches high x 16 inches long and shall have stiff nylon bristles. Bristle height shall be maintained at a minimum of 5 inches. The scrub broom may be equipped with hinged wing assemblies which shall not to exceed 4 feet per side including diagonals, and shall be equipped with street brooms.

The weight of the broom assembly shall be such that it does not remove the asphalt rejuvenating emulsion from the roadway surface.

The scrub broom frame shall be attached to and pulled by the distributor truck. The distributor truck shall be equipped with the means to mechanically lift the scrub broom off of the roadway surface at intermediate points of completion and remain in the elevated position during transit.

906-4 ROADWAY SURFACE PREPARATION. Roadway surface preparation shall conform to 302-2.4 of the SSPWC.

906-5 TEMPORARY TRAFFIC CONTROL. Temporary traffic control shall conform to 302-2.5 of the SSPWC and 601 of Section TC of the Special Provisions.

906-6 APPLICATION AND SPREADING.

- **906-6.1 General.** Application and spreading shall only be performed when the pavement is clean and dry, wind conditions are such that uniform coverage will result, and rain is not imminent.
- **906-6.2 Asphalt Rejuvenating Emulsion (ARE).** Application of ARE shall conform to 302-2.6.2 of the SSPWC and the following.

ARE shall not be applied:

- a) until sufficient screenings are on hand to immediately cover the ARE,
- b) more than 500 feet ahead of completed initial rolling.

The Contractor shall schedule ARE application such that the ARE breaks (turns from brown to black) before:

- c) the atmospheric temperature falls below 50°F,
- d) the pavement temperature falls below 60°F, and
- e) the time the lane is to be opened to public traffic.

ARE shall be applied to only one designated traffic lane at a time, and the full-width shall be covered in one operation.

The initial rate of application shall be 0.32 gallon per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall apply ARE to 100-foot test strips to assist in determination. The initial rate of application, and any adjustments thereto during application, shall be subject to approval by the Engineer.

After application, ARE shall completely and uniformly cover the underlying pavement and be free of streaks and voids.

Immediately following application, ARE shall be scrubbed into the existing pavement surface with a scrub broom. Scrubbing shall fill cracks and voids, force the ARE into the existing pavement surface, and distribute the ARE uniformly over the roadway cross section.

906-6.3 Screenings. Spreading of screenings shall conform to 302-2.6.3 of the SSPWC and the following:

If screenings are stockpiled, any testing performed by the Agency at the plant shall only be considered as preliminary. Screenings not conforming to the requirements of the Contract Documents shall not be delivered to the Work site. The Agency will perform subsequent testing on the stockpiled screenings to determine if they are in conformance with the requirements of the Contract Documents and may be used in the Work.

Spreading shall begin immediately following application. The initial rate of spreading shall be 24 pounds per square yard. The Contractor may propose a different initial rate of spreading. If so requested by the Engineer, the Contractor shall spread screenings on 100-foot test strips at different rates to aid in determination. The initial rate shall be adjusted up or down as necessary to provide complete and uniform coverage over the ARE and ensure that no bleeding occurs during rolling. The initial rate, and any adjustments thereto during spreading, shall be subject to approval by the Engineer.

- **906-7 FINISHING.** Finishing shall conform to 302-2.7 of the SSPWC.
- **906-8 FLUSH COAT.** Flush coat shall conform to 302-2.8 of the SSPWC and the following:

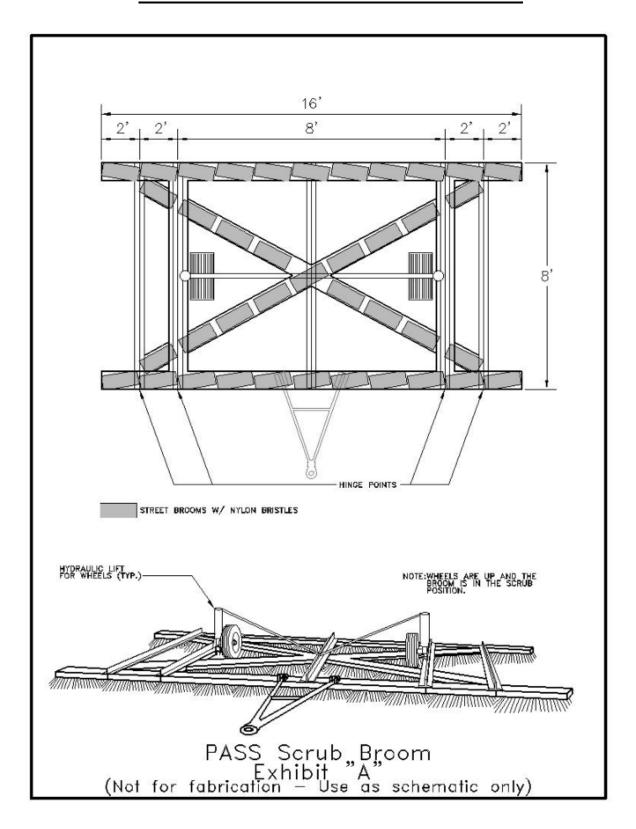
Emulsified asphalt shall be applied at a rate of *0.03 to 0.06 gallon per square yard*. The exact application rate shall be recommended by the Contractor and approved by the Engineer.

Sand shall be spread at a rate of **1 to 2 pounds per square yard**. The exact spread rate shall be recommended by the Contractor and approved by the Engineer.

- **906-9 MAINTENANCE.** Maintenance shall conform to 302-2.9 of the SSPWC.
- **906-10 MEASUREMENT.** Measurement shall conform to 302-2 of the SSPWC.
- **906-11 PAYMENT.** Payment shall conform to 302-2.10 of the SSPWC and the following:

Payment for scrub seal coat will be made at the Contract Unit Price per square yard for "SCRUB SEAL" for each type.

No adjustment in compensation will be made for any increase or decrease in the quantity of ARE or screenings necessary to obtain the application rates required by the Engineer.



SECTION 907 - TIRE RUBBER MODIFIED PAVING ASPHALT (TRMPA) CHIP SEAL

907-1 GENERAL. TRMPA chip seal shall consist of the application of tire rubber modified paving asphalt, pre-coated screenings, and a flush coat on existing roadway pavement.

907-2 MATERIALS.

907-2.1 Tire Rubber Modified Paving Asphalt (TRMPA).

907-2.1.1 General. TRMPA shall consist of paving asphalt containing a minimum of 15 percent ground scrap tire rubber. The scrap tire rubber shall be incorporated into the paving asphalt such that a smooth and homogeneous composition results. TRMPA shall be performance grade PG 76-22TR conforming to the requirements shown in Table 907-2.1.1.

TABLE 907-2.1.1

Property	AASHTO Test Method	Specification Grade PG
	Original Binder	76-22TR
Flack Daint Minimum 90	Original Binder	000
Flash Point, Minimum °C	T 48	230
Solubility, Minimum % ^b	T 44 ^c	97.5
Viscosity at 135°C, ^d Maximum, Pa·s	T 316	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	76 1.00
RTFO Test , Mass Loss, Maximum, %	T 240	1.00
	RTFO Test Aged Binder	
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	76 2.20
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum (delta), %	T 315	Note e 80
Elastic Recovery ^f , Test Temp., °C Minimum recovery, %	T 301	25 65
PAV ⁹ Aging, Temperature, °C	R 28	110
RTFO	D Test and PAV Aged Binder	
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*sin(delta), kPa	T 315	31 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value	T 313	-12 300 0.300

Notes:

- a. Do not modify using acid modification.
- b. The Engineer will waive this specification if the supplier is a Quality Supplier as defined by the Caltrans' "Certification Program for Suppliers of Asphalt."
- c. ASTM D5546 may be used instead of AASHTO T 44.
- d. The Engineer will waive this specification if the supplier certifies the paving asphalt can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G*/sin(delta) is 2.2 kPa. A graph of log G*/sin(delta) plotted against temperature may be used to determine the test temperature when G*/sin(delta) is 2.2 kPa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G*/sin(delta) is 2.2 kPa. The Engineer also accepts direct measurement of (delta) at the temperature when G*/sin(delta) is 2.2 kPa.
- f. Tests without a force ductility clamp may be performed.
- g. "PAV" means Pressurized Aging Vessel.

- **907-2.1.2 Certificate of Compliance.** A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall accompany each shipment of TRMPA to the Work site and be furnished to the Engineer. Test results supporting the Certificate of Compliance shall be from an AASHTO-certified laboratory.
- **907-2.2 Pre-Coated, Pre-Heated Screenings.** Pre-coated, pre-heated screenings shall be "Medium" conforming to 200-1.2.2.1 and 200-1.2.2.3 of the SSPWC.

907-2.3 Flush Coat.

- **907-2.3.1 Emulsified Asphalt.** Emulsified asphalt for fog seal coat shall be CQS-1h conforming to 203-3 of the SSPWC which may be diluted up to 50 percent with water. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.
- **907-2.3.2 Sand.** Sand for sand cover shall be sand for Portland cement concrete conforming to 200-1.5.3 of the SSPWC. A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be submitted to the Engineer prior to application.
 - **907-3 EQUIPMENT.** Equipment shall conform to 302-2.3 of the SSPWC.
- **907-4 ROADWAY SURFACE PREPARATION.** Roadway surface preparation shall conform to 302-2.4 of the SSPWC.
- **907-5 TEMPORARY TRAFFIC CONTROL.** Temporary traffic control shall conform to 302-2.5 of the SSPWC and 601 of Section TTC of the Special Provisions.

907-6 APPLICATION AND SPREADING.

- **907-6.1 General.** Application and spreading shall only be performed when the pavement is clean and dry, wind conditions are such that uniform coverage will result, and rain is not imminent.
- **907-6.2 Tire Rubber Modified Paving Asphalt (TRMPA).** Application of TRMPA shall conform to 302-2.6.3 of the SSPWC and the following:

TRMPA shall be applied to only one designated traffic lane at a time, and the full-width shall be covered in one operation.

TRMPA shall be applied at a rate of 0.35 to 0.44 gallon per square yard. The initial rate of application shall be 0.38 gallon per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall apply TRMPA to 100-foot test strips at different rates to assist in determination. The initial rate shall be adjusted up or down as necessary to provide complete and uniform coverage and ensure that no bleeding occurs during rolling. The initial rate, and any necessary adjustments thereto during application, shall be subject to approval by the Engineer.

During spraying, the application rate, as determined in accordance with California Test 339, shall not vary more than 15 percent transversely nor more than 10 percent longitudinally from the rate approved by the Engineer.

After application, TRMPA shall completely and uniformly cover the underlying pavement and be free of streaks and voids.

907-6.3 Pre-Coated, Pre-Heated Screenings. Spreading of screenings shall conform to 302-2.6.3.1 and 302-2.6.3.3 of the SSPWC and the following:

Stockpiling prior to application will not be permitted.

Screenings shall be a minimum of 220°F at the time of spreading.

The initial spread rate shall be 21 pounds per square yard. The Contractor may propose a different initial rate. If so requested by the Engineer, the Contractor shall spread screenings on 100-foot test strips at different rates to assist in determination. The initial rate, and any necessary adjustments thereto during spreading, shall be approved by the Engineer.

The calculated spread rate upon completion shall be within 5 percent of the rate approved by the Engineer.

- 907-7 FINISHING. Finishing shall conform to 302-2.7 of the SSPWC.
- **907-8 FLUSH COAT.** Flush coat shall conform to 302-2.8 of the SSPWC and the following:

Emulsified asphalt shall be applied at a rate of *0.03 to 0.06 gallons per square yard*. The exact application rate shall be recommended by the Contractor and approved by the Engineer.

The exact spread rate shall be recommended by the Contractor and approved by the Engineer. Spreading shall not vary more than 5 percent from rate approved by the Engineer.

- 907-9 MAINTENANCE. Maintenance shall conform to 302-2.9 of the SSPWC.
- **907-10 MEASUREMENT.** Measurement shall conform to 302-2.10 of the SSPWC.
- **907-11 PAYMENT.** Payment shall conform to 302-2.11 of the SSPWC and the following:

Payment for TRMPA chip seal will be made at the Contract Unit Price per square yard for "TRMPA CHIP SEAL."

No additional payment will be made for increases in the application and spreading rates requested by the Engineer.

SECTION 908 – POLYMER MODIFIED EMULSIFIED ASPHALT-RECLAIMED ASPHALT PAVEMENT AGGREGATE SLURRY SEAL (PMERAPAS).

908-1 GENERAL. PMERAPAS shall consist of the mixing, spreading and application of a stable mixture of polymer modified emulsified asphalt, reclaimed asphalt pavement aggregate, water, and set control agents.

908-2 MATERIALS.

908-2.1 Polymer Modified Emulsified Asphalt (PME). PME shall be grade PMCQS-1h conforming to the requirements shown in Table 908-2.1 (A).

Table 908-2.1 (A)

Property	Test method	Value	
		Min	Max
Tests on emulsion:			
Saybolt Furol Viscosity @ 25 °C, SFS ¹	AASHTO T 59	15	90
Sieve test, %	AASHTO T 59		0.30
Storage stability, 1 day, %	AASHTO T 59		1
Residue by evaporation, %	California Test 331	57	
Particle charge	AASHTO T 59	Positive	
Tests on residue by			
evaporation test			
Penetration, 25 °C	AASHTO T 49	40	90
Ductility, 25 °C, mm	AASHTO T 51	400	
Polymer content, %	California Test 401	3.0	

Notes:

- 1. SFS means Saybolt Furol seconds.
- Either neoprene polymer or butadiene and styrene copolymer shall be used. The
 polymer must be homogeneous and milled into the emulsified asphalt at the colloid
 mill

The percentage of emulsified asphalt and residual asphalt content shall conform to the requirements shown in Table 908-2.1 (B).

TABLE 908-2.1 (B)

	\ /	
Tests Emulsified Asphalt, % by	Test Method	Requirements
weight of dry RAP Aggregate	-	9.0 – 14.0
Residual Asphalt Content, % by weight of dry RAP Aggregate.	ASTM D6307 ¹ or CTM 382 ¹	11.0 Min.

^{1.} Sample size shall be 500g minimum.

908-2.2 Reclaimed Asphalt Pavement (RAP) Slurry Seal Aggregate.

908-2.2.1 General. RAP used to produce RAP slurry seal aggregate shall conform to 203-7.2.2, except for sand equivalent, and the requirements shown in Table 908-2.2.1.

TABLE 908-2.2.1

Tests	Test Method	Requirements
Percentage Wear, 500 Revolutions ¹	ASTM C131	35% Maximum
Sand Equivalent	ASTM D2419	60 Minimum
Soundness (5 Cycles) ¹	ASTM C88	15% Maximum
Durability	CTM 229	55 Minimum

^{1.} On RAP retained on No. 4 sieve.

908-2.2.2 Grading. The grading of the combined RAP aggregates shall conform to the requirements shown in Table 908-2.2.2.

Table 908-2.2.2

	Un-Extracted RAP Aggregate	Extracted RAP Aggregate (ASTM D1856)
Requirements	% of Combined Aggregate Passing Sieves (ASTM C136)	% of Combined Aggregate Passing Sieves (ASTM C136)
3/8" (9.5 mm)	100	100
No. 4 (4.74 mm)	90 – 100	90 - 100
No. 8 (2.36 mm)	60 – 90	65 - 90
No. 16 (1.18 mm)	35 – 60	45 - 70
No. 30 (600 µm)	23 – 45	30 - 50
No.50 (300 µm)	12 – 30	18 - 36
No. 100 (150 μm)	5 – 20	10 - 24
No. 200 (75 μm)	0.5 – 10	5 - 15

908-2.2.3 Water. Water shall be potable and compatible with the other ingredients of the slurry.

908-2.2.4 Set Control Agents. Set control agents shall conform to 203-5.4.2.5 of the SSPWC.

908-3 MIX DESIGNS. Mix designs shall conform to 203-5.2 of the SSPWC.

908-4 CONTINUOUS-FLOW MIXERS. PMERAPAS shall be mixed in continuous-flow mixers conforming to 302-4.3 of the SSPWC and the following:

Prior to the beginning of slurry operations, the Contractor shall furnish current licensed weighmaster's certificates indicating the net weight capacity of the aggregate bin of each mixer. Except for partial loads to complete a Day's schedule, or for patching, each mixer shall be filled to its rated capacity and the Engineer and the Contractor shall each keep a daily count of the number of loads and/or partial loads applied to the surface of the existing pavement by each mixer. Each aggregate bin shall have permanent calibration marks in maximum increments of 2 tons.

908-5 SCHEDULING, PUBLIC CONVENIENCE, AND TRAFFIC CONTROL. Scheduling, public convenience, and traffic control shall conform to 302-4.5 of the SSPWC and 601 of Section TTC. "No Parking" signs will be furnished by the Agency. The Contractor shall only post Agency-furnished "No Parking" signs unless otherwise approved or directed by the Engineer.

908-6 SPREADING AND APPLICATION.

908-6.1 General. PMERAPAS shall be applied at a rate of 10 to 15 pounds of dry RAP aggregate per square yard over existing or micro-milled pavement and at a rate of a minimum of 19 pounds of dry RAP aggregate per square yard over chip seals. The exact rate shall be as directed or approved by the Engineer.

When the Engineer determines that the application rate does not conform to the requirements, the Contractor shall take immediate corrective action. When the rate is less than the minimum amount required, the Contractor shall reapply additional PMERAPAS to the nonconforming area to meet the requirements.

The sites for stockpiling and batching materials shall be free and clean from objectionable material. Arrangements for these sites shall be the responsibility of the Contractor.

The Contractor shall have 2 fully operational mixers for use at the Work site at all times. These mixers shall be available for inspection by the Engineer at least 48 hours prior to commencing the Work.

908-6.2 Spreading and Application. Spreading and application shall conform to 302-4.8 of the SSPWC and the following:

The Contractor will be required to work around all existing utility facilities and to seal up to the edges of said facilities. During sealing operations, the Contractor shall cooperate with the owners of any utility covers and shall cover and completely protect said covers with heavy plastic or other suitable material. Raised pavement markers shall be removed or covered and completely protected as directed by the Engineer. The Contractor shall exercise care to prevent slurry from being deposited on concrete surfaces and shall remove slurry from surfaces not designated to be sealed. Covering of slurry on concrete surfaces with sand, cement, or paint will not be acceptable.

PMERAPAS, after spreading and application, shall be rolled with 3 passes of a pneumatic roller conforming to 302-2.3.5 of the SSPWC.

908-7 FIELD SAMPLING AND TESTING. During the performance of the Work, the Agency will take at least 2 field samples of the mixed slurry per slurry mixer per Day. The Wet Track Abrasion Test sample shall not be transported until the slurry has set as defined by ASTM D3910. Field samples shall conform to the requirements shown in Table 908-7.

TABLE 908-7

Tests	ASTM Test Method	Requ Min.	irements Max.
Wet Track Abrasion Test, Weight loss, gm/ft ² (gm/m ²) Type Fine Aggregate	D3910 ¹	0	50 (540)
Consistency Test (mm)	D3910 ¹		30
Extraction Test (Calculated Emulsion Content, %)	D6307 ² , CT 382 ²	± 1 % o	mix design
Water Content (% of Dry RAP Aggregate Weight)	See Note 3	< 25	

- Modified ASTM D3910 to include No. 4 (4.75 mm) aggregate or greater and to be performed using field samples. Subsection 6.4.4.7, ASTM D 3910 may be modified to use a microwave oven for drying the specimen after the abrasion cycle is complete and the debris washed off.
- 2. Modified ASTM D6307 and California Test Method 382 to allow a minimum of 500 ± 50 gram sample.
- Weigh a minimum of 500 grams of homogenized mixed slurry into a previously tared quart can with a friction lid. The lid shall be
 placed on the can to prevent loss of material during transportation. Place the can with the lid off in an oven and dry to constant
 mass at 220°F ± 10°F (110° C ± 5°C).
- 4. The 3/8 inch (9.5 mm) template shall be used.

ASTM D3910, modified per 203-5.2, shall be used on field samples during performance of the Work. These results will be used in conjunction with 908-9.2.2. The Contractor may perform "referee" sampling on its behalf. Each referee sample shall be taken immediately before, during or after the sampling by the Agency. No changes in machine calibration will be allowed between sampling. The Agency will observe the referee sampling to insure compliance with specified procedures. The Agency shall be given the opportunity to observe the remaining portions of the WTAT to assure the accuracy of the referee test. The Contractor shall notify the Engineer at least 24 hours in advance of actual test performance. The referee WTAT shall be performed by an independent, certified laboratory. The results of each referee test will be compared to the respective test performed by the Agency. At the discretion of the Engineer, the referee test may be used as a basis to modify the result of the respective test performed by the Agency. All costs for referee testing shall be considered as included in the Contract Unit Price for emulsion-aggregate slurry.

If the test results fail to meet the Specifications, the Contractor shall cease spreading slurry seal produced by the nonconforming mixer until the Contractor demonstrates the mixer is producing slurry seal which conforms to the Specifications.

[Include the following if the unit of measurement is "ELT:"]

908-8 MEASUREMENT. PMERAPAS will be measured by the weight of dry RAP aggregate used in the Work.

The Contractor shall submit to the Engineer, no later than noon of the first Working Day following the day of delivery, licensed weighmaster certificates showing the weight of RAP slurry seal aggregate delivered to the Project stockpile site. Only aggregate intended for use on the Work shall be delivered to the Project stockpile site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of aggregate remaining at the Project stockpile site. Payment will be determined by deducting the remaining

weight from the total weight of aggregate delivered to the Project stockpile site. The Engineer will compare this quantity to the quantity calculated by multiplying the number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will adjust the calculated weight for partial loads and deduct the quantity of aggregate used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight of each type of aggregate used.

The Contractor shall furnish, operate, maintain, and remove portable scales at the stockpile site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

908-9 PAYMENT.

908-9.1 General. Payment for PMERAPAS will be made at the Contract Unit Price per Extra Long Ton (ELT) for "PME-RAP AGGREGATE SLURRY SEAL." An ELT shall be defined as 2,000 pounds of dry RAP aggregate. The Contract Unit Price shall include polymer modified emulsified asphalt, RAP slurry seal aggregate, set control agents, and water. No separate payment will be made for portable scales.

[End ELT basis of payment inclusion.]

[Include the following if the units of measurement are tons of emulsified asphalt and tons of RAP slurry aggregate:]

908-8 MEASUREMENT. The basis of measurement shall be the weight of materials, in tons, used in the Work, as determined by licensed weighmaster certificates. Upon completion of the Work, the Contractor shall submit to the Engineer licensed weighmaster certificates for materials delivered to the Work site and for excess materials not incorporated into the Work.

PMERAPAS will be measured by each ton of polymer modified emulsified asphalt (PMCQS-1h) and each ton of RAP slurry seal aggregate used in the Work.

The Contractor shall submit to the Engineer, no later than noon of the first Working Day following the day of delivery, licensed weighmaster certificates showing the weight of emulsified asphalt and RAP slurry seal aggregate delivered to the Project stockpile/storage site. Only emulsified asphalt and aggregate intended for use on the Work shall be delivered to the Project stockpile/storage site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of emulsified asphalt and aggregate remaining at the Project site. Payment will be determined by deducting the weight of unused emulsified asphalt and unused aggregate from the total weight of each material delivered to the Project stockpile/storage site. The Engineer will compare these quantities to the quantities calculated by multiplying the number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will

adjust the calculated weights for partial loads and deduct the quantities of each material used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight.

The Contractor shall furnish, maintain, portable operate, and remove scales at the stockpile/storage site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

908-9 PAYMENT.

908-9.1 General. Payment for polymer modified emulsified asphalt will be made at the Contract Unit Price per ton for "POLYMER MODIFIED EMULSIFIED ASPHALT (PMCQS-1h)." Payment for RAP slurry seal aggregate will be made at the Contract Unit Price per ton for "RAP SLURRY SEAL AGGREGATE."

No separate payment will be made for portable scales.

[End individual tonnage of PME and RAP aggregate basis of payment inclusion.]

[Include the following if the basis of measurement is tons (combined tonnage of PME and RAP aggregate), referred to as the "wet ton.")

908-8 MEASUREMENT. The basis of measurement shall be the weight of materials, in tons, used in the Work, as determined by licensed weighmaster certificates. Upon completion of the Work, the Contractor shall submit to the Engineer licensed weighmaster certificates for materials delivered to the Work site and for excess materials not incorporated into the Work.

PMERAPAS will be measured by the total of the tonnage of polymer modified emulsified asphalt (PMCQS-1h) and RAP slurry seal aggregate used in the Work.

The Contractor shall submit to the Engineer, no later than noon of the first Working Day following the day of delivery, licensed weighmaster certificates showing the weight of emulsified asphalt and RAP slurry seal aggregate delivered to the Project stockpile/storage site. Only PME and RAP aggregate intended for use on the Work shall be delivered to the Project stockpile/storage site. Deliveries shall not be made on Saturday, Sunday, or holidays unless otherwise approved by the Engineer. Prior to acceptance of the Work, the Contractor shall also submit to the Engineer licensed weighmaster's certificates showing the weight of PME and RAP aggregate remaining at the Project site. Payment will be determined by deducting the weight of unused PME and unused RAP aggregate from the total weight of each material delivered to the Project stockpile/storage site. The Engineer will compare these quantities to the quantities calculated by multiplying the number of loads spread by each continuous-flow mixer times the net weight capacity of each mixer. The Engineer will adjust the calculated weights for partial loads and deduct the quantities of each material used to prevent tracking, if any. If there is an unaccountable difference between the respective weights, final measurement will be determined by the Engineer using the method showing the lesser weight.

The Contractor shall furnish. maintain, remove portable operate. and scales at the stockpile/storage site. Said scales shall be certified by the County of Los Angeles Agricultural Commissioner/Weights and Measures, http://acwm.lacounty.gov/scripts/default.htm, prior to beginning usage.

908-9 PAYMENT.

908-9.1 General. Payment for PMERAPAS will be made at the Contract Unit Price per ton for "PME-RAP SLURRY SEAL."

No separate payment will be made for portable scales.

[End "wet ton" basis of payment inclusion.]

908-9.2 Payment Reduction for Noncompliance.

908-9.2.1 General. Payment to the Contractor will be reduced for failure to comply with the Wet Track Abrasion Testing requirements specified in 908-7. The percent reduction will be based on the requirements specified in 908-9.2.2. Reduction in payment will be applied to all of the material placed per Day by the nonconforming slurry mixer.

908-9.2.2 Reduction in Payment Based on WTAT. If the average of all Wet Track Abrasion Tests made per slurry mixer per day by the Engineer fail to conform to the requirements specified in 908-7, the Contractor agrees that payments for the work represented by the failed tests shall be reduced as shown in Table 908-9.2.2.

TABLE 908-9.2.2

WTAT Loss gm/ft ² (gm/m ²)	Payment Reduction (Percent)
0 – 50 (0 – 540)	0
50.1 - 60 (540.1 - 650)	5
60.1 – 70 (650.1 – 750)	15
70.1 – 80 (750.1 – 860)	30
80.1 – 99 (860.1 – 1070)	70
99.1 or greater (1070.1 or greater ¹)	100

Slurry seal surfacing with WTAT loss greater than 99.1 gm/m² (1070.1 gm/ft²) shall be removed to the satisfaction of the Engineer.

SECTION 909 - MICROSURFACING

909-1 GENERAL. Microsurfacing shall consist of mixing a microsurfacing emulsion (MSE), water, additives, mineral filler, and aggregate; and spreading the mixture on a pavement surface as shown on the Plans.

909-2 MATERIALS.

909-2.1 Microsurfacing Emulsion (MSE). MSE shall be a quick-traffic, homogeneous, polymer-modified, cationic asphalt emulsion. MSE shall conform to the requirements specified in AASHTO M208 or ASTM D2397 for CSS-1h and Table 909-2.1. The cement mixing test shall be waived for MSE.

TABLE 909-2.1

Test Method	Requirement	
AASHTO T 59	15-90 sec	
AASHTO T 59	0.30%	
ASTM D 244	5%	
AASHTO T 59	1%	
California Test 331	64 %	
Test Method	Requirement	
AASHTO T 49	40-90	
AASHTO T 53	135°F (57°C)	
	AASHTO T 59 AASHTO T 59 ASTM D 244 AASHTO T 59 California Test 331 Test Method AASHTO T 49	

Polymers shall be milled or blended into the asphalt or blended into the emulsifier solution prior to the emulsification process. MSE shall contain a minimum of 3 percent polymer solids based on the weight of residual asphalt and shall be certified by the MSE supplier.

The 5-Day settlement test may be waived, provided MSE stored for use on the Work site is used within 36 hours from the time of shipment-

A Certificate of Compliance conforming to 4-1.5 of the SSPWC shall be furnished with each shipment of MSE and submitted to the Engineer.

909-2.2 Water and Additives. Water shall be potable, free of harmful soluble salts, reactive chemicals, and any other contaminants, and of such quality that the asphalt will not separate from the MSE before the microsurfacing mixture is placed.

If necessary for workability, liquid additives that will not adversely affect the microsurfacing mixture may be used if so approved by the Engineer.

- **909-2.3 Mineral Filler.** Mineral filler shall be non-air entrained portland cement or hydrated lime that is free of lumps. Portland cement shall be Type I, Type II, Type III or a combination thereof. The type of mineral filler shall be determined by the Contractor based on laboratory mix designs. Mineral filler will be considered part of the aggregate gradation requirement. An increase or decrease of 1 percent may be approved by the Engineer if necessary for better consistency or set times.
- **909-2.4 Aggregate.** Aggregate type shall be as shown on the Plans. Aggregate shall be free from vegetable matter and other deleterious substances, lumps and oversize particles.

Aggregate shall conform to the grading and quality requirements prior to the addition of the MSE. If aggregates are blended, each component aggregate shall conform to the sand equivalent and durability index requirements.

The percentage composition by weight of aggregate, including mineral filler, shall conform to Table 909-2.4 (A) for Type II and Table 909-2.4 (B) for Type III.

TABLE 909-2.4 (A)

Sieve Sizes	Percentage Passing
3/8 (9.5 mm)	100
No. 4 (4.75 mm)	94 – 100
No. 8 (2.36 mm)	65 – 90
No. 16 (1.18 mm)	40 – 70
No. 30 (600 μm)	25 – 50
No. 200 (75 μm)	5 – 15

TABLE 909-2.4 (B)

Sieve Sizes	Percentage Passing
3/8 (9.5 mm)	100
No. 4 (4.75 mm)	70 – 90
No. 8 (2.36 mm)	45 – 70
No. 16 (1.18 mm)	28 – 50
No. 30 (600 μm)	19 – 34
No. 200 (75 μm)	5 – 15

The aggregate, excluding mineral filler, shall conform to the requirements shown in Table 909-2.4 (C).

TABLE 909-2.4 (C)

Test	California Test	Requirement
Sand Equivalent, min.	217	65
Durability Index, min.	229	55
Percentage of Crushed Particles, min. ¹	205	100%
Los Angeles Rattler Loss at 500 Rev., max. ²	211	35%

Notes:

- California Test 205, Section D, is amended to read: "Any particle having 2 or more freshly, mechanically fractured faces shall be considered a crushed particle."
- California Test 211, Los Angeles Rattler, shall be performed on the parent aggregate before crushing

No single aggregate grading or sand equivalent test shall represent more than 275 tons or one Day of production, whichever is smaller.

909-2.5 Mix Design. The Contractor shall submit in accordance with 2-5.3 of Section G a laboratory report of tests and a proposed mix design covering the specific materials proposed for use on the Work. The component materials used in the mix design must be the same materials that will be used during microsurfacing placement.

The percentages of each individual material proposed in the mix design shall be shown in the laboratory report. Adjustments may be required during construction based on field conditions. Individual materials shall be within the limits shown in Table 909-2.5 (A).

TABLE 909-2.5 (A)

MSE Residual	5.5% to 10.5% by dry weight of aggregate
Asphalt	
Water and Additives	No Limit
Mineral Filler	0% to 3% by dry weight of aggregate

Binder content shall be determined by the mix design, not specified.

The mix designs and aggregate tests shall be performed by a laboratory capable of performing the applicable International Slurry Surfacing Association (ISSA) tests. The proposed microsurfacing mixtures shall conform to the specified requirements when tested in conformance with the tests shown in Table 909-2.5 (B).

TABLE 909-2.5 (B)

Test	ISSA Test Method	Requirements		
Wet Cohesion	TB* 139			
@ 30 Minute (Set), min.		12 kg-cm		
@ 60 Minute (Traffic), min.		20 kg-cm		
Excess Asphalt, max.	TB* 109	50 g/ft ² (540 g/m ²)		
Wet Stripping, min.	TB* 114	Pass (90% Minimum)		
Wet Track Abrasion Loss	TB* 100			
6-day Soak, max.		75g/ft ² (810 g/m ²)		
Displacement	TB* 147A			
Lateral, max.		5%		
Specific Gravity After 1000 Cycles				
of 125 lbs (57 kg), Max.		2.10		
Classification Compatibility, min.	TB* 144	(AAA, BAA) 11 Grade Points		
		Minimum		
Mix Time @ 77°F, min.	TB* 113	Controllable to 120 Seconds		
		Minimum		

TB* = Technical Bulletin

The laboratory that performed the tests and designed the mixtures shall sign the laboratory report. The report shall show the results of the tests on individual materials and shall compare their values to those required by these Special Provisions. The report shall clearly show the proportions of aggregate, water (minimum and maximum), additive usage, mineral filler (minimum and maximum), and MSE residual asphalt content (minimum and maximum) based on the dry weight of aggregate. The laboratory shall report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect) in conformance with the requirements of ASTM C29M. Previous laboratory reports covering the same materials may be accepted provided the material test reports were completed within the previous 12 months. The mix design shall further show the recommended changes in water, additive, and mineral filler proportions for high temperature weather conditions by reporting proportions of materials required for 60 seconds of mix time with materials heated to 100°F.

The component materials used in the mix design shall be representative of the microsurfacing materials proposed by the Contractor for use on the Work.

Once the mix design is approved by the Engineer, no substitution of other material will be permitted unless the materials proposed for substitution are first tested and a laboratory report is submitted for the substituted design in conformance with these special provisions. Substituted materials shall not be used until the mix design for those materials has been approved by the Engineer.

The completed mixture, after addition of water and additives, if additives are used, shall be such that the microsurfacing mixture has proper workability. At the expiration of the time allowed for closure of lanes, the microsurfacing mixture shall be sufficiently cured to support unrestricted traffic.

909-2.6 Proportioning. Aggregate, water, additives (if used), mineral filler, and MSE shall be proportioned by volume utilizing the mix design approved by the Engineer. If more than one kind of aggregate is used, the correct amount of each kind of aggregate to produce the required grading shall be proportioned separately, prior to adding the other materials of the mixture, in a manner that will result in a uniform and homogeneous blend.

The aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate. The height of the gate opening shall be determinable. The MSE shall be proportioned by a positive displacement pump. Variable rate emulsion pumps, if used, shall be calibrated and sealed in the pump's calibrated condition in conformance with California Test 109 prior to usage.

The delivery rate of aggregate and MSE per revolution of the aggregate feeder shall be calibrated at the appropriate gate settings for each mixer-spreader truck used on the project in conformance with California Test 109.

The aggregate belt feeder shall deliver aggregate to the pugmill with such volumetric consistency that the deviation for any individual aggregate delivery rate check-run shall not exceed 2 percent of the mathematical average of 3 runs of a minimum of 3 tons each. The emulsion pump shall deliver MSE to the pugmill with such volumetric consistency that the deviation for any individual delivery rate check-run shall be within 2 percent of the mathematical average of 3 runs of a minimum of 300 gallons each.

The MSE storage tank shall be located immediately before the emulsion pump and shall be equipped with a device which will automatically shut down the power to the emulsion pump and aggregate belt feeder when the MSE level is lowered to a point where the pump suction line is exposed.

A temperature-indicating device shall be installed in the emulsion storage tank at the pump suction level. The device shall indicate the temperature of the MSE and shall be accurate to within 5°F.

The belt delivering the aggregate to the pugmill shall be equipped with a device to monitor the depth of aggregate being delivered to the pugmill. The device for monitoring the depth of aggregate shall automatically shut down the power to the aggregate belt feeder whenever the depth of aggregate is less than the target depth of flow. A second device shall be located where the device will monitor the movement of the aggregate belt by detecting revolutions of the belt feeder. The devices for monitoring no flow or belt movement shall automatically shut down the power to the aggregate belt when the aggregate belt movement is interrupted. The device to detect revolutions of the belt feeder will not be required where the aggregate delivery belt is an integral part of the drive chain. To avoid erroneous shutdown by normal fluctuation, a delay of 3 seconds will be permitted between sensing and shutdown of the operation.

909-3 MIXING AND SPREADING EQUIPMENT.

[Use 909-3.1 and 3.2 as follows unless continuous mixers cannot be used due to roadway constraints such as tight curves, winding alignments, etc.]

909-3.1 General. Mixing and spreading equipment shall be approved by the Engineer prior to the start of the Work. Mixer-spreader machines shall conform to 909-3.2 except that mixer-spreader trucks may be used in the following areas only:

- Cul-de-sacs.
- 2. Side streets.
- 3. Gore areas.
- 4. Areas requiring hand work.

909-3.2 Mixer-Spreader Machines. Mixer-spreader machines (machines) shall be specifically designed and manufactured to place microsurfacing, self-propelled, self-loading, and capable of loading materials while continuing to lay microsurfacing. Machines shall be equipped with a continuous-flow mixing unit capable of accurately proportioning and delivering the aggregate, MSE, mineral filler, water and additives to a revolving double-shafted mixer and discharging the resulting microsurfacing mixture on continuous-flow basis. Batch machines will not be acceptable. Machines shall have sufficient storage capacity for aggregate, MSE, mineral filler, water and additives to maintain an adequate supply to the proportioning controls. All indicators shall be in working order prior to commencing mixing and spreading operations. Rotating and reciprocating equipment shall be covered with metal guards.

Machines shall not be operated unless low-flow and no-flow devices and revolution counters are in good working condition and functioning and metal guards are in place. The required indicators shall be visible while walking alongside a machine.

Aggregate feeders shall be connected directly to the drive on the emulsion pump. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest one-tenth of a revolution.

The identifying number of each machine shall be a minimum of 3 inches in height, located on the front and rear of the vehicle.

The microsurfacing mixture shall be spread by means of a spreader box. However, when wheel path depressions have a cross section that is deformed 1/2 inch or more, the individual wheel paths shall first be filled utilizing a wheel path depression (rut) box.

[Use 909-3.1 and 3.2 as follows if mixer-spreader trucks will be allowed. Do not include the provisions above.]

909-3.1 General. Mixing and spreading equipment shall be approved by the Engineer prior to the start of the Work.

909-3.2 Mixer-Spreader Trucks. Mixer-spreader trucks shall be continuous-flow mixers conforming to 302-4.2.2 of the SSPWC modified as necessary to be capable of producing and placing microsurfacing. Trucks shall have sufficient storage capacity for aggregate, MSE, mineral filler, water and additives to maintain an adequate supply to the proportioning controls. Aggregate feeders shall be connected directly to the drive on the emulsion pump. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest one-tenth of a revolution.

The identifying number of each machine shall be a minimum of 3 inches in height, located on the front and rear of the vehicle.

The mixer-spreader truck shall not be operated unless low-flow and no-flow devices and revolution counters are in good working condition and functioning and metal guards are in place. The required indicators shall be visible while walking alongside the mixer-spreader truck. All indicators shall be in working order prior to commencing mixing and spreading operations.

The microsurfacing mixture shall be spread by means of a spreader box conforming to 909-3.3. However, when wheel path depressions have a cross section that is deformed 1/2 inch or more, the individual wheel paths shall first be filled utilizing a wheel path depression (rut) box conforming to 909-3.4.

909-3.3 Spreader Box. Spreader boxes shall be capable of placing the microsurfacing mixture a minimum of 14 feet wide and preventing loss. Spreader boxes over 8 feet in application width shall have baffles, reversible motor driven augers or other suitable means to insure uniform application on super-elevated sections and shoulder slopes. Spreader boxes shall be maintained in such manner as to prevent chatter (wash boarding) in the finished mat. Spreader boxes shall be clean and free of microsurfacing mixture at the start of each work shift.

Spreader boxes shall have a series of strike-off devices at the rear. The leading strike-off device shall be fabricated of steel, stiff rubber or other suitable material. The number of strike-off devices shall be determined by the Contractor. The first strike-off device shall be designed to maintain close contact with the pavement during the spreading operations, shall obtain the thickness required, and shall be capable of being adjusted to the various pavement cross sections for application of a uniform microsurfacing finished surface. All strike-off devices shall be fabricated of flexible material suitable for the intended use and shall be designed and operated to ensure that a uniform texture is achieved in the finished surface. The final strike-off device shall be cleaned daily and changed if problems with longitudinal scouring occur.

Flexible fabric drags attached to the rear of the spreader box shall not be used.

909-3.4 Wheel Path Depression (Rut) Box. Rut boxes shall be designed to have adjustable strike-off devices to regulate the depth and shall have a width of between 5 and 6 feet. Hydraulic augers, or similar devices, shall be installed and shall be capable of moving the mixed material from the rear to the front of the filling chamber. These devices shall also be capable of guiding the larger aggregate into the center, deeper section of the wheel path depression, and forcing the finer material toward the outer edges of the spreader box.

In areas inaccessible to a rut box, the microsurfacing mixture may be spread by other methods approval by the Engineer.

909-4 JUST-IN-TIME-TRAINING (JITT). Attendance at a 2-hour-minimum Just-In-Time-Training (JITT) class shall be mandatory, and shall consist of a formal joint training class on microsurfacing materials, equipment and placement. Microsurfacing placement shall not begin until the Contractor's personnel, the Engineer, and Agency staff have completed the mandatory JITT. The Contractor's personnel involved in microsurfacing quality control, as well as equipment operators and crew involved in the microsurfacing operation, shall attend. The Engineer, and Agency staff involved will also attend. JITT shall be in addition to the preconstruction conference.

The training class shall be conducted at a Project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed not more than 5 Days, not including Saturdays, Sundays or holidays, prior to the start of microsurfacing operations. The class shall be held during normal working hours.

The JITT instructor shall be provided by the Contractor. The instructor shall be experienced in the construction methods, materials, and test methods associated with construction of microsurfacing projects. A copy of the course syllabus, handouts, and presentation material shall be submitted in accordance with 2-5.3 and 6-1.2 of Section G. The Contractor and the Engineer shall mutually agree to the course instructor, course content, and training site.

909-5 PREPARATION FOR MICROSURFACING. Before placing microsurfacing, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to remove loose particles of paving, dirt, and other extraneous material. When required by local conditions, the roadway surface may be fogged with water ahead of the spreader box. The application of the fog spray may be adjusted to suit temperatures, surface texture, humidity, and dryness of pavement.

Thermoplastic striping and pavement markings, raised pavement markers, and raised pavement marker adhesive shall be removed.

Manhole covers, utility vaults and the surfaces of other utility facilities, survey monuments and benchmarks, shall be covered using a material approved by the Engineer. The material and procedure shall result in no adherence of the microsurfacing to the facility and no stripping of the microsurfacing from the adjacent pavement.

909-6 PLACEMENT. Microsurfacing shall be uniformly spread on the existing surfacing within the rate specified without spotting, re-handling, or otherwise shifting the mixture. Placement shall not begin until the Contractor's personnel, the Engineer, and Agency staff have attended the Just-In-Time-Training in conformance with 902-4.

Mixer-spreaders shall be capable of spreading the microsurfacing mixture in one continuous application per work shift. Other than joints at the start and end of each work shift, joints no other joints will be allowed.

Microsurfacing shall not be placed when either the ambient or pavement temperature is below 50°F or during unsuitable weather. Microsurfacing shall not be placed if rain is imminent or if there is the possibility that there will be freezing temperatures within 24 hours.

When wheel path depressions have a cross section that is deformed ½ inch or more, the individual wheel paths shall first be filled utilizing a wheel path depression (rut) box. The depth of the wheel path depression shall be determined after adjacent ridges have been removed. The maximum single application for wheel path depressions shall be 1 inch. Wheel path depressions of depths greater than 1 inch shall require multiple applications in each depression.

Wheel path depression repair shall be constructed with a slight crown to allow for initial compaction by traffic on the microsurfacing.

Freshly filled wheel path depressions shall be compacted by traffic for a minimum of 48 hours before additional lifts of microsurfacing are placed for rut filling purposes or as surface courses.

Microsurfacing shall be spread at the rates of pounds of dry aggregate per square yard shown in Table 909-6.

TABLE 909-6

Microsurfacing Type	Location	Spread Rate (lbs/yd²)	
Type II	Full Lane Width	18-24	
Type III ¹	Full Lane Width	18-24	
Type III ²	Full Lane Width	22-31	

Notes:

- 1. For microsurfacing over asphalt concrete pavement.
- 2. For microsurfacing over portland cement concrete pavement and concrete bridge decks.

Longitudinal joints shall correspond with the edges of the final traffic lanes. The Engineer may permit other patterns of longitudinal joints if the patterns will not adversely affect the quality of the finished product.

Through traffic lanes shall be spread in full lane widths only. Longitudinal joints common to 2 traffic lanes shall be butt joints with overlaps not to exceed 3 inches. Building paper shall be placed at the transverse joints to avoid double placement of the microsurfacing. Transverse joints shall be straight, clean and have no variation in surface texture from the rest of the mat. Other suitable methods to avoid double placement of the microsurfacing will be allowed. Hand tools shall be available to remove spillage.

The mixture shall be uniform and homogeneous after placing on the surfacing and shall not show separation of the MSE and aggregate after setting. The completed surface shall be of uniform texture and free from ruts, humps, depressions, or irregularities.

Microsurfacing shall be protected from damage by traffic until such time that the mixture has cured sufficiently so that the microsurfacing will not adhere to or be picked up by the tires of vehicles.

Microsurfacing shall be swept approximately 24 hours after placement to remove loosened or shed aggregate particles. Thereafter, microsurfacing shall be swept, when directed by the Engineer, for up to 10 Days after placement to remove loosened or shed aggregate particles. Sweeping shall be performed in such a manner that the microsurfacing will not be damaged.

909-7 TRAFFIC CONTROL. In addition to the requirements of 601 of Section TTC of the Special Provisions, the Contractor shall comply with the following requirements:

- a) Microsurfacing operations shall cease a minimum of 1 hour before the expiration of the times specified for lane closures in 601 of Section TTC.
- b) Microsurfacing shall only be applied to half the width of the traveled way at a time. The remaining half width shall be kept free of obstructions and open for use by public traffic at all times.
- c) Traffic shall not be allowed on newly placed microsurfacing until it has sufficiently set and bonded.
- d) When the newly completed surface treatment is open to public traffic, traffic shall be controlled by the use of flaggers and a pilot car for a period of 6 hours or for such time as deemed necessary by the Engineer as follows:
 - Station a flagger at the beginning of each newly completed section, to stop oncoming traffic preparatory to piloting operations. Keep the flaggers on duty during the entire control period.
 - ii) Move traffic control as described above, ahead progressively as the newly completed surface is open to traffic.

909-8 TEST STRIP. The Contractor shall construct a minimum of 2 test strips for evaluation by the Engineer. Each test strip shall be 300 to 500 feet long, a minimum of 1500 square yards in size, shall replicate the full production placement of microsurfacing, and shall consist of the application courses specified. Each test strip shall be constructed at the same time of day that the full production of microsurfacing will be placed. Each test strip may be constructed in 2 Days when multiple course applications are specified. If the microsurfacing is to be placed on a scrub seal or chip seal, the test strips must be placed over the underlying seal coat. The Contractor shall propose adjustments in the mixture to compensate for sudden changes in weather conditions.

The Engineer will evaluate each completed test strip for 48 hours after traffic has been allowed on it to determine if the mix design and placement procedure are acceptable. If the mix design or the placement procedure is determined by the Engineer to be unacceptable, the test strips will be rejected, the Contractor shall make modifications, and new test strips shall be constructed. The new test strips will be evaluated by the Engineer as previously specified. Rejected test strips shall be removed if so directed by the Engineer.

909-9 MEASUREMENT. Microsurfacing will be measured by the combined weight of the tons of dry aggregate, excluding mineral filler, and the tons of MSE used in the microsurfacing mixture placed and accepted by the Engineer. The weight of added water, additives, and mineral filler used in the microsurfacing mixture will not be included in the weight measured for payment. No deduction will be made for water in the aggregate and MSE.

The Contractor shall furnish the Engineer with a written plan covering the intended method of delivery, storage and measurement of dry aggregate and MSE. The Contractor shall furnish the Engineer with licensed weighmaster tickets for each load of dry aggregate and MSE delivered to the stockpile site or directly to each mixer-spreader machine.

The Contractor shall furnish and have in place at the stockpile site operable portable scales with a current seal affixed by the County of Los Angeles Agricultural Commissioner/Weights and Measures. Upon completion of the Work, the Contractor shall determine the net weight of the remaining dry aggregate and MSE in the presence of the Engineer.

909-10 PAYMENT. Payment for microsurfacing will be made at the Contract Unit Price per ton for "MICROSURFACING (TYPE II)" and "MICROSURFACING (TYPE III)." The Contract Unit Price per ton shall include performing all the work involved in placing microsurfacing, complete in place, including testing for and furnishing mix design(s), test strips, just-in-time-training, portable scales, cleaning the surface, furnishing added water, additives, and mineral filler, protecting the microsurfacing until it has set, repair of early distress, and sweeping the microsurfacing.

No payment will be made for test strips which have been rejected or for removal of rejected test strips.

O:\Contract Documents\Standard Special Provisions\Section R (2015 Edition)(3-1-16).doc

ATTACHMENT 1 CONSTRUCTION AND DEMOLITION DEBRIS RECYCLING SUMMARY

Project Information

Check one: □ Roadw	<i>r</i> ay	_	☐ Flood Control		Water/Sewer			
□ Traffic	Signal/Street	Lighting	□ Bridge/Structure		Other			
Project Name:			-					
					_			
	Grid No(s).: Office Engineer:							
Contractor Information								
Company Name:	Company Name:							
			Phone Nu					
Construction Demol	ition and De	bris Recyclir	ng Requirements Cos	t: \$				
	Estimated Quantity	Reu	ise/Recycling		Disposal			
Type(s) of Debris Generated	Generated (tons, c.y. or units)	Estimated Quantity (tons, c.y. or units)	Name of Reuse/Recycling Facility/Site	Estimated Quantity (tons, c.y. or units)	Name of Disposal Facility			
Asphalt		·		,				
Brick								
Concrete								
Green Waste								
Metal (ferrous)								
Metal (non-ferrous)								
Mixed Debris								
Rock								
Soil								
Wood Waste								
Other:								
Other:								
Total								
Notes:	-	-						
 Other debris types may include, but are not limited to, Ash, Cardboard, Carpeting, Glass, Gravel, Land Clearing Debris, Non-friable Asbestos, Paper, Plastic, Porcelain, Roofing Material, Sand, and Tires. Attach additional sheets if necessary. If the debris is taken to a transfer station solely for the purpose of reuse/recycling, then list the transfer station as the reuse/recycling facility/site. If the debris is taken to a transfer station solely for the purpose of transfer to a disposal facility, then list the transfer station as the disposal facility. 								
Please fax this completed form to (626) 737-1723 (no cover sheet needed)								
To: C&D Unit, LACDPW From:								

O:\Contract Documents\Standard Special Provisions\Section R (2015 Edition)(3-1-16).doc